Fact Sheet

NPDES Permit Number:	WA-003716-8
Public Notice Date:	October 25, 2002
Public Notice Expiration Date:	November 25, 2002
Technical Contact:	Susan Poulsom 206 553-6258 or 1-800-424-4372 (within Region 10) poulsom.susan@epa.gov

The U.S. Environmental Protection Agency (EPA) Proposes to Reissue a Wastewater Discharge Permit to:

City of Puyallup Wastewater Treatment Plant
2028 River Road
Puyallup, WA 98371

and the Puyallup Tribe proposes to Certify the Permit

EPA Proposes NPDES Permit Reissuance

EPA proposes to reissue a National Pollutant Discharge Elimination System (NPDES) permit to the City of Puyallup Wastewater Treatment Plant. The draft permit sets conditions on the discharge of pollutants from the City's waste water treatment plant to the Puyallup River. In order to ensure protection of water quality and human health, the permit places limits on the types and amounts of pollutants that can be discharged.

This fact sheet includes:

- information on public comment, public hearing, and appeal procedures
- a description of the current and proposed discharge
- a listing of past and proposed effluent limitations and other conditions
- a map and description of the discharge location
- detailed background information supporting the conditions in the draft permit

Puyallup Tribe Certification

The Puyallup Tribe proposes to certify the NPDES permit for the City of Puyallup, under section 401 of the Clean Water Act. The Tribe provided preliminary comments prior to the Public Notice which have been incorporated into the draft permit.

Public Comment

Persons wishing to comment on or request a public hearing for the draft permit may do so in writing by the expiration date of the Public Notice. All comments or requests for a public hearing should include the name, address and telephone number of the commentator and a concise statement of the exact basis of any comment and the relevant facts upon which it is based. All comments and requests for a public hearing must be in writing and should be submitted to EPA as described in the Public Comments Section of the attached Public Notice.

If no significant comments are received, the tentative conditions in the draft permit will become final, and the permit will become effective upon issuance. If comments are received, EPA will address the comments and issue the permit. The permit will become effective 33 days after the issuance date, unless a request for an evidentiary hearing is submitted within 33 days.

Documents are Available for Review

The draft NPDES permit and related documents can be reviewed or obtained by visiting or contacting EPA's Regional Office in Seattle between 8:30 a.m. and 4:00 p.m., Monday through Friday (See address below).

United States Environmental Protection Agency
Region 10
1200 Sixth Avenue, OW-130
Seattle, Washington 98101
(206) 553-0523 or
1-800-424-4372 (within Alaska, Idaho, Oregon and Washington)

The fact sheet and draft permit are also available at:

EPA Washington Operations Office
300 Desmond Drive SE
Lacey, WA 98503
360 753-9080

Puyallup Tribe
Environmental Department
2002 28th Street
Tacoma, WA 98404
253 573-7851

Washington Department of Ecology
300 Desmond Drive SE
Lacey, WA 98503
360 407-6275

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LIST OF ACRONYMS AND ABBREVIATIONS

AML	Average monthly limit
BMP	Best management practices
BOD_5	Five-day biochemical oxygen demand
CFR	Code of Federal Regulations
cfs	Cubic feet per second
CWA	Clean Water Act
DMR	Discharge monitoring report
CV	Coefficient of variation
Ecology	Washington State Dept. of Ecology
EPA	United States Environmental Protection Agency
lb/day	Pounds per day
LTA	Long term average
MDL	Maximum daily limit or method detection limit
mgd	Million gallons per day
mg/L	Milligrams per liter
ml	Milliliters
MOA	Memorandum of agreement
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and maintenance
POTW	Publicly owned treatment works
RP	Reasonable potential
TMDL	Total maximum daily load
TSD	*Technical Support Document for Water Quality-based Toxics Control*, (EPA 1991)
TSS	Total suspended solids
USGS	United States Geological Survey
WWTP	Wastewater treatment plant
WLA	Wasteload allocation
µg/L	Micrograms per liter

BACKGROUND INFORMATION

I. APPLICANT

City of Puyallup Wastewater Treatment Plant
NPDES Permit No: WA-003716-8

Facility Location:
2028 River Road
Puyallup, WA 98371

Mailing Address:
218 West Pioneer Avenue
Puyallup, WA 98371

Facility contact: Tom Heinecke, Public Works Director

II. FACILITY ACTIVITY

The City of Puyallup owns and operates a municipal treatment facility that provides secondary treatment and disinfection of domestic and industrial wastes prior to discharge to the Puyallup River. The maximum month design flow of the facility is 13.98 million gallons per day (mgd). In 2001, the treatment plant had a average annual flow of 3.75 mgd, and a maximum monthly flow of 5.61 mgd. Biosolids generated during the treatment process are hauled by a private contractor, to a land application site in eastern Washington.

See Appendix A for a map of the location of the treatment plant and discharge. Appendix B contains additional information on the treatment processes and waste streams.

III. RECEIVING WATER

The Puyallup Wastewater Treatment Plant (WWTP) discharges to the Puyallup River (latitude 47° 12' 26" N, longitude 122° 19' 11" W) located within the 1873 survey area of the Puyallup Reservation. The Puyallup Tribe of Indians is the beneficial owner of the bed and banks (to the mean high water mark) of the Puyallup River within the 1873 survey area of the Puyallup Reservation, which the United States holds in trust for the Tribe.

The Puyallup Tribe's Water Quality Standards designate beneficial uses for waters of the Reservation. The Puyallup River is designated as Class A in the vicinity of the outfall. Characteristic uses include the following: domestic, industrial and agricultural water supply, stock watering, fish and shellfish (including salmonids, crustaceans and other shellfish, and other fish), wildlife habitat, ceremonial and religious water use, commerce, navigation, and primary and secondary recreation.

The Puyallup River currently meets the State of Washington's (and the Puyallup Tribe's) water quality standards. However, a 1994 Ecology water quality study of the river identified the potential for future problems in meeting the dissolved oxygen criteria if existing NPDES facilities reached their design capacity. As a result, Ecology established a seasonal preventative total maximum daily load (TMDL) for ammonia and five-day biochemical oxygen demand (BOD_5) for the Puyallup River basin and tributaries effective May 1 through October 31 (Ecology, 1993 and 1994). This preventative TMDL was used in establishing the limits for BOD_5 and ammonia in the draft permit. (See section IV of Appendix C for details.)

IV. FACILITY BACKGROUND

A. Treatment System

The original collection system for the City's wastewater was constructed in 1905 as a gravity sewer system discharging directly into the Puyallup River. In 1955, a 6.0 mgd sewage treatment plant providing primary treatment and disinfection was constructed at the present site. In 1984, the treatment plant was upgraded to a secondary treatment system utilizing rotating biological contactors (RBCs). The current upgrade, which came on-line in April 1999, replaced the RBCs with activated sludge and replaced the chlorination with ultraviolet disinfection.

Although the original collection system was built as a combined storm and sanitary system, the system is now 100 percent separated. A sewer system rehabilitation project completed in 1981 significantly reduced inflow and infiltration.

B. Permit Status

On June 30, 1994, Ecology issued a National Pollutant Discharge Elimination System (NPDES) permit to the City. The permit established interim effluent limitations for chlorine, ammonia, copper, and mercury and a schedule to achieve compliance with final effluent limits for these parameters. The City appealed the effluent limits for ammonia, copper, and mercury based on the assumption that the effluent limitations were calculated from a limited and non-representative database and could not be consistently achieved. As part of the settlement reached between the City and Ecology, the City and Ecology agreed to 13 weeks of additional monitoring of ammonia, copper, and mercury using clean sampling techniques. Using that data, a reasonable potential determination was made to determine if effluent limitations were still required and the interim and effluent limits were re-evaluated.

In 1995, based on the results of the 13 weeks of additional sampling, Ecology modified the permit. The modifications included: less stringent interim effluent limits for ammonia, more stringent interim and final effluent limits for mercury, and elimination of interim and final effluent copper limits.

In 1997, EPA, the Puyallup Tribe, and Ecology signed a memorandum of agreement (MOA) regarding implementation of the NPDES permit program on the Puyallup Reservation. The MOA recognized that the federal government has the authority to issue NPDES permits for discharges to waters of the Reservation. In addition, the MOA stipulated that Ecology would provide technical review and permit preparation services for NPDES permits on the Reservation and that EPA would issue the permits. This draft permit has been prepared jointly by EPA, Ecology, and the Tribe under the conditions of the MOA.

The City submitted an application for permit renewal on December 12, 1998. Because the City submitted a timely application, the 1994 permit has been administratively extended and the City is authorized to continue discharging until the permit is reissued. A draft permit for the facility was proposed in June 2000. Because changes were made to the proposed effluent limits following public notice of the draft permit (because of additional background and monitoring data), a new draft permit with this revised fact sheet was prepared.

C. Compliance Status

Table 1 summarizes the reported effluent limit violations for the Puyallup WWTP based on Discharge Monitoring Reports (DMRs) between January 1996 and December 2001.

Table 1: Reported Effluent Limit Violations 1996 Through 2001[1]

Year	Parameter	# of Violations
1996 - 1999	BOD_5 monthly average (mg/L)	4
	BOD_5 weekly average (mg/L)	1
	BOD_5 monthly average (lbs/day)	7
	BOD_5 weekly average (lbs/day)	7
	BOD_5 percent removal	9

Table 1: Reported Effluent Limit Violations 1996 Through 2001[1]

Year	Parameter	# of Violations
	TSS monthly average (mg/L)	3
	TSS weekly average (mg/L)	2
	TSS monthly average (lbs/day)	6
	TSS weekly average (lbs/day)	6
	TSS percent removal	7
	Coliform, monthly average	2
2000	TSS monthly average (mg/L)	1
	TSS weekly average (mg/L)	2
	TSS monthly average (lbs/day)	1
	TSS weekly average (lbs/day)	2

Note:
1 No violations were reported in 2001.

V. EFFLUENT LIMITATIONS

EPA followed the Clean Water Act (CWA), Tribal and federal regulations, and EPA's 1991 *Technical Support Document for Water Quality-Based Toxics Control* (TSD) to develop the proposed effluent limits. In general, the CWA requires that the effluent limits for a particular pollutant be the more stringent of either the technology-based or water quality-based limits. Appendix C provides the basis for the development of technology-based and water quality-based effluent limits.

Technology-based limits are set based on the level of treatment that is achievable using readily available technology. For publicly owned treatment works, federal regulations include technology-based limits for three parameters: five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH.

The EPA evaluates the technology-based limits to determine whether they are adequate to ensure that water quality standards are met in the receiving water. If the limits are not adequate, EPA must develop additional water quality-based limits. These limits are designed to prevent exceedences of the Puyallup Tribe's water quality standards in the Puyallup River. The proposed permit includes water quality-based loading limits for BOD_5, fecal coliform bacteria, total ammonia, copper, lead, mercury, and zinc. Appendix D provides an example calculation for development of a water quality-based permit limit.

Table 2 compares the limits in the existing permit with those in the draft permit. The draft permit specifies more stringent limits for ammonia and pH and requires limits for three parameters which were not in the previous permit: copper, lead, and zinc. The existing wastewater treatment facility may have difficulty meeting the proposed copper and zinc limits. As part of its pre-certification under section 401 of the CWA, the Tribe has granted the City a compliance schedule to meet the proposed copper and zinc permit limits. Recent monitoring data for all other parameters were below the draft permit limits. For BOD_5 and ammonia, effluent concentrations have been below the draft permit limits since the 1999 upgrade.

Table 2: Outfall 001 Effluent Limits Comparison[1]

Parameter	Average Monthly Limit		Average Weekly Limit		Maximum Daily Limit	
	Draft Permit (2002)	Existing Permit (1994)[2]	Draft Permit (2002)	Existing Permit (1994)	Draft Permit (2002)	Existing Permit (1994)
BOD_5, Effluent						
mg/L	30	30	45	45	---	---
lb/day	1,390	1,390	2,085	2,085	---	---
Minimum Percent Removal	85	85	---	---	---	---
BOD_5, Influent						
lb/day	---	---	---	---	---	9,267
TSS, Effluent						
mg/L	30	30	45	45	---	---
lb/day	2,333	1,390	3,499	2,085	---	---
Minimum Percent Removal	85	85	---	---	---	---
TSS, Influent						
lb/day	---	---	---	---	---	9,267
Fecal Coliform						
#/100 ml[3]	100	100	---	---	---	---
Total Ammonia (as N) November 1 - April 30						
mg/L	5.8	9.5	---	---	14.9	18
lb/day	676	---	---	---	1,737	---
Total Ammonia (as N) May 1 - October 31						
mg/L	4.2	9.5	---	---	12.0	18
lb/day	490	---	---	---	880	880

Table 2: Outfall 001 Effluent Limits Comparison[1]

Parameter	Average Monthly Limit		Average Weekly Limit		Maximum Daily Limit	
	Draft Permit (2002)	Existing Permit (1994)[2]	Draft Permit (2002)	Existing Permit (1994)	Draft Permit (2002)	Existing Permit (1994)
Copper, Total Recoverable :g/l lb/day	 3.5 0.41	 --- ---	 --- ---	 --- ---	 5.5 0.64	 --- ---
Lead, Total Recoverable :g/l lb/day	 3.7 0.43	 --- ---	 --- ---	 --- ---	 6.3 0.73	 --- ---
Mercury :g/l lb/day	 0.052 0.006	 0.014 ---	 --- ---	 --- ---	 0.069 0.008	 0.019 —
Zinc, Total Recoverable :g/l lb/day	 31 3.6	 --- ---	 --- ---	 --- ---	 47 5.5	 --- ---
pH, std units	—[4]	---	—[4]	---	6.2-9.0[4]	6.0-9.0
Flow, mgd Monthly Avg Wet Weather Monthly Avg Dry Weather Instantaneous Peak	 --- --- ---	 10.42 4.78 ---	 --- --- ---	 --- --- ---	 --- --- ---	 --- --- 18.98
Total Residual Chlorine :g/l	 ---	 21	 ---	 ---	 ---	 50

Notes:

1 With the exception of BOD$_5$ and TSS, the mass-based loadings are based on a design flow of 13.4 mgd. See Appendix C Basis for Effluent Limits.

2 The existing permit was issued in 1994. The permit limits for ammonia, copper, and mercury were modified in 1995. The table lists the 1995 modified limits.

3. The existing (1994) permit and draft (2002) permit also contain the requirement that no more than 10% of samples over a 30 day period may exceed 200/100 ml.

4 The draft permit requires that the pH be within the specified range of 6.2 to 9.0 at all times.

In addition to the limits for specific parameters the draft permit authorizes the discharge of only those pollutants resulting from facility processes, waste streams, and operations that have been clearly identified in the permit application process. The draft permit also requires that the discharge be free from floating solids, visible foam in other than trace amounts, or oily wastes that produce a sheen on the surface of the receiving water.

VI. PRETREATMENT PROGRAM

Section 301(b) of the CWA requires that industrial users who discharge to publicly owned treatment works comply with pretreatment requirements established under section 307 of the CWA. The objectives of the pretreatment program are: 1) to prevent the introduction of pollutants to the treatment system that will interfere with the plant's operation, that could pass untreated through the system and contribute to water quality problems, or otherwise be incompatible with the treatment plant, and 2) to improve opportunities to reclaim and recycle municipal and industrial waste water and sludges.

The 1994 permit required the City of Puyallup to conduct influent, effluent, and sludge monitoring for priority pollutants listed in Table II of 40 CFR 122 Appendix D and develop appropriate local limits. However, under the 1994 permit, the City was not required to establish an approved pretreatment program.

The draft permit requires the City to develop a pretreatment program in accordance with the general pretreatment regulations at 40 CFR §403. A draft program must be submitted to EPA for approval within **12 months of the effective date** of the permit. At a minimum, the pretreatment program submittal must include a local limits evaluation for pollutants of concern, a proposed local sewer use ordinance, verification by the city's attorney that the City has the legal authorities to conduct the pretreatment program, and implementation policies and procedures (e.g. enforcement, compliance monitoring, permit administration, and data management), including funding and staffing levels to manage the pretreatment program.

The draft permit requires that metals analyses be conducted using the most sensitive EPA-approved methods, unless a less sensitive method is approved by EPA's Pretreatment Coordinator. This provision ensures that the City will use the most sensitive EPA-approved analytical method currently available when influent or effluent concentrations for a particular pollutant are near or below the lowest method detection limit without imposing the financial burden of using these methods when a less sensitive method will provide quantifiable data.

VII. MUNICIPAL SEWAGE SLUDGE/BIOSOLIDS MANAGEMENT

Currently, dewatered sludges are hauled to eastern Washington for land application. The applicator is Natural Selection Farm, Inc., located in Sunnyside Washington. Natural Farms currently has two permitted land application sites: the Green Valley Project and the Prosser/Mabton Project, both in Yakima County.

EPA Region 10 has recently decided to separate the permitting of wastewater discharges and the disposal of biosolids. Under the CWA, EPA has the authority to issue separate "sludge only" NPDES permits for the purposes of regulating biosolids. EPA has historically implemented the biosolids standards by inclusion of the requirements in a facility's NPDES wastewater permit, the other option authorized by the CWA.

EPA will issue a sludge-only permit to this facility at a later date. This will likely be in the form of a general permit through which EPA can cover multiple facilities. Meanwhile, the environment will be protected since the Permittee's sludge activities will continue to be subject to the national sewage sludge standards at 40 CFR Part 503. Part 503 contains provisions relating to pollutants in sewage sludge, the reduction of pathogens in sewage sludge, the reduction of the characteristics in sewage sludge that attract vectors, the quality of the exit gas from a sewage sludge incinerator stack, the quality of sewage sludge that is placed in a municipal solid waste landfill unit, the sites where sewage sludge is either land applied or placed for final disposal, and sewage sludge incinerators. The CWA prohibits any use or disposal of biosolids not in compliance with these standards. EPA has the authority under the CWA to enforce these standards directly, including in the absence of a permit. The CWA does not require the facility to have a permit prior to the use or disposal of its biosolids.

VIII. MONITORING REQUIREMENTS

A. Effluent Monitoring

Section 308 of the CWA and federal regulation 40 CFR 122.44(i) require that monitoring be included in permits to determine compliance with effluent limitations. Monitoring may also be required to gather data for future effluent limitations or to monitor effluent impacts on receiving water quality. The City of Puyallup is responsible for conducting the monitoring and for reporting results to EPA on DMRs.

Table 3 compares the proposed monitoring requirements in the draft permit to those in the 1994 permit. Monitoring frequency is based on the minimum sampling necessary to adequately monitor the facility's performance as well as the monitoring requirements in the 1994 permit.

Table 3: Outfall 001 Monitoring Requirements

Parameter	Draft Sample Frequency	1994 Sample Frequency
BOD_5, mg/L, lb/day, percent removal[1]	5/Week	3/Week
TSS, mg/L, lb/day, percent removal[1]	5/Week	3/Week
Fecal Coliform Bacteria, #/100 ml	5/Week	3/Week
Total Ammonia as N, mg/L	2/Week	2/Week

Table 3: Outfall 001 Monitoring Requirements

Parameter	Draft Sample Frequency	1994 Sample Frequency
Copper, Total Recoverable, :g/l	Monthly	Quarterly[2]
Lead, Total Recoverable, :g/l	Monthly	Quarterly[2]
Mercury, Total Recoverable, :g/l	Monthly	Monthly
Zinc, Total Recoverable, :g/l	Monthly	Quarterly[2]
pH, standard units[3]	Continuous	Daily
Flow, mgd	Continuous	Continuous
Temperature, °C	Daily	Daily
Chronic Whole Effluent Toxicity Testing	Annual	Quarterly for 1st year, twice in the last year
Hardness, mg/L $CaCO_3$	Monthly	---
Acute Whole Effluent Toxicity Testing	Annual	Quarterly for 1st year, twice in the last year
Total Residual Chlorine, mg/L	---	Daily
Rainfall	---	Daily

Notes:
1 The draft permit and the 1994 permit require influent and effluent monitoring to determine compliance with effluent limitations and percent removal requirements.
2 Monitoring was required as part of the City's pretreatment requirements.
3 The draft permit requires the City to report the number and duration of pH excursions during the month.

B. Method Detection Limits

EPA's regulations require that permittees monitor for compliance with effluent limits using methods promulgated by EPA at 40 CFR Part 136. The water quality-based limits in the draft permit for copper and lead are near the method detection limit (MDL) for the most sensitive methods in Part 136.

For all pollutants, the draft permit requires the City to use an EPA-approved method with an MDL 0.1 times the effluent limitation or the most sensitive EPA-approved method, whichever is greater. This provision ensures that, to the extent possible, data can be used to accurately determine compliance with permit limits without imposing an undue burden on the City where a less sensitive method will give accurate data.

C. Whole Effluent Toxicity

Federal regulations at 40 CFR 122.44(d)(1) require that permits contain limits on whole effluent toxicity when a discharge has reasonable potential to cause or contribute to an exceedence of a water quality standard. Section 5, paragraphs 1 and 2 of the Puyallup water quality standards prohibit the discharge of toxic substances in toxic amounts and require that toxicity testing be used to determine compliance with this prohibition.

Whole effluent toxicity tests are laboratory tests that replicate to the greatest extent possible the total effect and actual environmental exposure of aquatic life to effluent toxicants without requiring the identification of specific toxicants. Whole effluent toxicity tests use small vertebrate and invertebrate species and/or plants to measure the aggregate toxicity of an effluent. There are two different durations of toxicity tests: acute and chronic. Acute toxicity tests measure survival over a 48- or 96-hour exposure. Chronic toxicity tests measure reductions in survival, growth, and reproduction over a 7-day exposure.

The City of Puyallup's 1994 permit required quarterly acute and chronic toxicity testing for the first year and two acute and chronic toxicity tests in the final year of the permit. This testing showed no reasonable potential to cause or contribute to exceedences of the water quality standard. This testing, however, generated only 6 data points each for acute and chronic toxicity. Where there are fewer than 10 data points, the TSD recommends using a default CV of 0.6 to evaluate reasonable potential to exceed water quality standards. EPA believes that it is preferable to use a site-specific CV. To allow the City to spread the cost out, the permit requires **annual testing** to generate 5 additional acute and chronic data points.

D. Receiving Water Monitoring

Receiving water monitoring is needed to evaluate if the effluent is causing or contributing to an instream excursion of the water quality criteria. The draft permit requires the permittee to conduct ambient monitoring of copper, lead, mercury, zinc, pH, and ammonia. The permittee must use test methods that achieve the same MDLs as are necessary for effluent sampling. To the extent practicable, receiving water monitoring must occur on the same day as effluent sample collection and during low river flow conditions. The proposed receiving water monitoring requirements for the draft permit are provided in Table 4.

Table 4: Receiving Water Monitoring Requirements in the Puyallup River			
Parameter	**Location**	**Sample Frequency**	**Sample Type**
Total Ammonia as N, mg/L	Edge of Mixing Zone	Annual	Grab
Copper, Total Recoverable, :g/l	Edge of Mixing Zone	Annual	Grab
Lead, Total Recoverable, :g/l	Edge of Mixing Zone	Annual	Grab
Mercury, Total Recoverable, :g/l	Edge of Mixing Zone	Annual	Grab
Zinc, Total Recoverable, :g/l	Edge of Mixing Zone	Annual	Grab
pH, standard units	Edge of Mixing Zone	Annual	Grab

E. Outfall Evaluation

Because of sediment deposition of gravel and rocks, most of the ports in the original diffuser were damaged. The City estimated that only seven ports remained intact and were usable. To address this problem, the City installed a secondary outfall point to discharge flows in excess of 6.0 mgd. In early 1998, the City began construction of a new facility, including modification to the existing diffuser ports to prevent damage by gravel and rocks. The diffuser ports are angled downstream with a “Tide Flex” valve connected with a neoprene sleeve and flange.

To ensure that the new diffuser is not damaged by sediment deposition, the draft permit requires the City to conduct an outfall evaluation during the **second and fourth year** of the permit term.

F. Infiltration and Inflow Evaluation

In the past, significant rainfall events have been a source of primary-treated overflows to the Puyallup River from the outfall. Infiltration and inflow to the conveyance system might include rainwater entering manholes, roof drain connections, combined stormwater and sewage piping, infiltration through leaky underground pipes, etc. The draft permit requires that the permittee conduct a comprehensive study that includes a preliminary evaluation of the sewerage facility and a system-wide inventory/evaluation survey that identifies the causes of the untreated/primary-treated overflows and contains deadlines for correcting the problems. This report is due **three years from the effective date** of the permit.

G. Representative Sampling

The draft permit has expanded the requirement in the federal regulations regarding monitoring (40 CFR 122.41[j]). This provision now specifically requires representative sampling whenever a bypass, spill, or non-routine discharge of pollutants occurs, if the discharge may reasonably be expected to cause or contribute to a violation of an effluent limit under the permit. If such a discharge occurs, the City must conduct additional, targeted monitoring to quantify the effects of the discharge on the final effluent. This provision is included in the draft permit because routine monitoring could easily miss permit violations and/or water quality standards exceedences that could result from bypasses, spills, or non-routine discharges.

IX. OTHER PERMIT CONDITIONS

A. Quality Assurance Plan

Federal regulations at 40 CFR 122.41(e) require permittees to properly operate and maintain their facilities, including "adequate laboratory controls and appropriate quality assurance procedures." To implement this requirement, the draft permit requires that the City develop a Quality Assurance Plan to ensure that monitoring data are accurate and to explain data anomalies if they occur. The City is required to implement the plan within **120 days of the effective date** of the draft permit. The Quality Assurance Plan must include standard operating procedures the City must follow for collecting, handling, storing and shipping samples, laboratory analysis, and data reporting.

B. Operation & Maintenance Plan

Section 402 of the CWA and federal regulations 40 CFR 122.44(k)(2) and (3) authorize EPA to require best management practices, or BMPs, in NPDES permits. BMPs are measures for controlling the generation of pollutants and their release to waterways. For municipal facilities, these measures are typically included in the facility's Operation & Maintenance (O&M) plan. These measures are important tools for waste minimization and pollution prevention.

The draft permit requires the City of Puyallup to incorporate appropriate BMPs into their O&M plan within **180 days of permit issuance**. Specifically, the City must consider spill prevention and control, optimization of chemical use, public education aimed at controlling the introduction of household hazardous materials to the sewer system, and water conservation. To the extent that any of these issues have already been addressed, the City need only reference the appropriate document in its O&M plan. The O&M plan must be revised as new practices are developed.

As part of proper operation and maintenance, the draft permit requires the City to develop a facility plan when the annual average flow exceeds 85 percent of the average annual design flow of the plant (9.46 mgd). This plan requires the City to develop a strategy for remaining in compliance with effluent limits in the permit.

C. Additional Permit Provisions

In addition to facility-specific requirements, sections IV, V, and VI of the draft permit contain “boilerplate” requirements. Boilerplate is standard regulatory language that applies to all permittees and must be included in NPDES permits. Because the boilerplate requirements are based on regulations, they cannot be challenged in the context of an NPDES permit action. The boilerplate covers requirements such as monitoring, recording, and reporting requirements, compliance responsibilities, and general requirements.

X. OTHER LEGAL REQUIREMENTS

A. Endangered Species Act

Section 7 of the Endangered Species Act requires federal agencies to consult with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) if the actions could beneficially or adversely affect any threatened or endangered species. EPA requested lists of threatened and endangered species from the NMFS and USFWS in letters dated December 10, 1999. In a letter dated January 24, 2000, the USFWS identified the Bald eagle (*Haliaeetus leucocephalus*) and Bull trout (*Salvelinus confluentus*) as threatened. In a phone call on December 16, 1999, the NMFS identified the Chinook salmon (*Oncorhynchus tshawytscha*) as threatened. Neither agency identified any proposed or candidate species.

The EPA tentatively determined that issuance of the NPDES permit is **not likely to adversely effect** the bald eagle or the cutthroat trout. The EPA also made the determination that the discharge is **not likely to adversely effect** the chinook salmon. A biological evaluation was provided to the NMFS and USFWS for the bald eagle, bull trout, and the chinook salmon (EPA, 2000). The EPA also provided copies of the June 2000 draft permit and fact sheet. The USFWS concurred that issuance of the permit is not likely to adversely affect the bald eagle or bull trout (USFWS, 2000). NMFS concurred with the finding that issuance of the permit is not likely to adversely affect the chinook salmon (NMFS, 2000). Any additional comments received from these agencies regarding this determination will be considered prior to reissuance of this permit.

Under the Magnuson-Stevens Fishery Conservation and Management Act, the NMFS and various fisheries management councils must identify and protect “essential fish habitat” for species managed under the Act. The NMFS and fisheries councils reviewed and approved the City of Puyallup facilities planning documents for the 1999 upgrade. The EPA tentatively has determined that issuance of the NPDES permit will have **no effect** on essential fish habitat. Any comments received from the NMFS regarding the finding of **no effect** will be considered prior to reissuance of this permit.

B. Certification

Section 401 of the CWA requires EPA to seek certification from the Tribe that the permit is adequate to meet Tribal water quality standards before issuing a final permit. The regulations allow for the Tribe to stipulate more stringent conditions in the permit, if the certification cites the CWA or Tribal law provisions upon which that condition is based. In addition, the regulations (40 CFR 124.53(e)(3)) require a certification to include statements of the extent to which each condition of the permit can be made less stringent without violating the requirements of Tribal law.

Part of the Tribe's certification is authorization of a mixing zone. The draft permit contains a mixing zone based on the provisions in the Puyallup Water Quality Standards. If the Tribe authorizes a different mixing zone in its final certification, EPA will recalculate the effluent limitations based on the dilution available in the final mixing zone. If the Tribe does not certify the mixing zone, EPA will recalculate the permit limitations based on meeting water quality standards at the point of discharge.

The Tribe stipulated conditions of the draft permit and fact sheet as part of the pre-certification. A copy of the Tribe's pre-certification is provided in Appendix H.

C. Permit Expiration

This permit will expire **five years from the effective date**.

REFERENCES

City of Puyallup, 1995. *Final Effluent Ammonia, Copper and Mercury Evaluation.* May 1995.

EPA 1991. *Technical Support Document for Water Quality-based Toxics Control*. Office of Water Enforcement and Permits, Office of Water Regulations and Standards. Washington, D.C., March 1991. EPA/505/2-90-001.

EPA 2000. Biological Evaluation for the City of Puyallup Wastewater Treatment Plant NPDES Permit Reissuance. June 2000.

Fish and Wildlife Service, 2000. Letter from Gerry A. Jackson (FWS) to Kelly Huynh (EPA) - *(FWS Reference: 1-3-00-I-1511).* November 16, 2000.

Gray and Osborne, 1996. *City of Puyallup Wastewater Facility Plan.* June 1996.

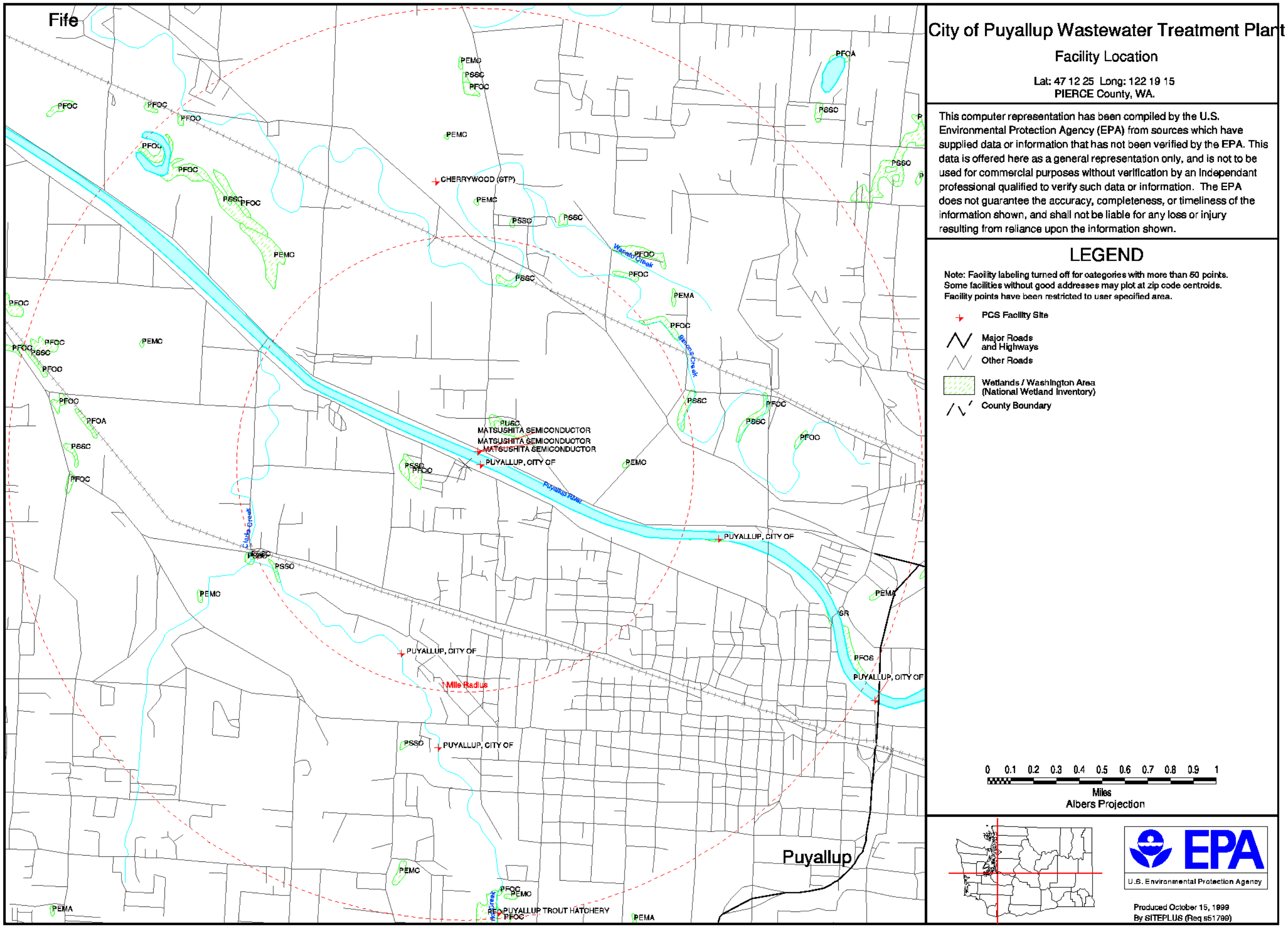
National Marine Fisheries Service, 2000. Letter from Donna Darm (NMFS) to Kelly Huynh (EPA) - *Re: Biological Evaluation for City of Puyallup Wastewater Treatment Plant NPDES Permit Reissuance (NMFS No. WSB-00-322)*, December 19, 2000.

Washington State Department of Ecology, 1993. *Puyallup River Total Maximum Daily Load for Biochemical Oxygen Demand, Ammonia, and Residual Chlorine*. June 1993.

Washington State Department of Ecology, 1994. *Addendum to the 1993 Puyallup River TMDL Report.* July 1994.

APPENDIX A - CITY OF PUYALLUP FACILITY LOCATION

Figure A-1: Puyallup Wastewater Treatment Facility Location



APPENDIX B - CITY OF PUYALLUP WASTE STREAMS AND TREATMENT PROCESSES

I. Discharge Composition

In determining the pollutants present in the discharge and their maximum concentrations, EPA considered the City's NPDES application, discharge monitoring reports, and priority pollutant scans (collected as part of the City's pretreatment requirements). Table B-1 lists the maximum concentration of pollutants reported by the City as being detected in its discharge. The toxic and conventional pollutant categories are defined in the regulations (40 CFR 401.15 and 401.16, respectively). The category of nonconventional pollutants includes all pollutants not included in either of the other categories.

Table B-1: Pollutants Detected in Discharge (1996 to 2001)

Pollutant Type	Parameter	Maximum Reported Concentration[1]
Conventional	BOD_5, monthly average	40 mg/L
	TSS, monthly average	42 mg/L
	pH, min - max	6.0 - 8.7 s.u.
	Fecal Coliform Bacteria, monthly average	181 /100 ml
Toxic	Copper, daily maximum[2]	54 : g/l[2]
	Lead, daily maximum[2]	3 : g/l
	Mercury, daily maximum	0.06 : g/l
	Zinc, daily maximum[2]	79 : g/l
Non-conventional	Ammonia, daily maximum	26 mg/L
	Temperature	23^{O} C

Notes:
1 Metals concentrations are reported as total recoverable metals.
2. Maximum concentrations do not include statistical outliers.

II. Treatment Processes

Preliminary treatment:
- Solids removal (fine screen)
- Dewatering and landfilling removed solids

Primary treatment:
- Primary Clarification
- Sludge/grit centrifugal separation
- Grit disposal to landfill

Secondary treatment:
- Activated Sludge
- Secondary Clarification
- UV Disinfection

Final Discharge
- Average Annual Flow - 9.46 mgd
- Design Flow (Maximum Month) - 13.98 mgd

Biosolids (sludge) handling
- Anaerobic digestion
- Belt filter press
- Hauling by private contractor for land application

APPENDIX C - BASIS FOR EFFLUENT LIMITATIONS

I. Statutory and Regulatory Basis for Limits

Sections 101, 301(b), 304, 308, 401, 402, and 405 of the Clean Water Act (CWA) provide the basis for the effluent limitations and other conditions in the draft permit. The EPA evaluates discharges with respect to these sections of the CWA and the relevant NPDES regulations to determine which conditions to include in the draft permit.

In general, the EPA first determines which technology-based limits must be incorporated into the permit. EPA then evaluates the effluent quality expected to result from these controls, to see if it could result in any exceedences of the water quality standards in the receiving water. If exceedences could occur, EPA must include water quality-based limits in the permit. The draft permit limits reflect whichever requirements (technology-based or water quality-based) are more stringent. A table of the limits that EPA is proposing in the draft permit is found in section V of this fact sheet. This Appendix describes the technology-based and water quality-based evaluations for the City of Puyallup WWTP.

II. Technology-based Evaluation

The 1972 CWA required publicly owned treatment works (POTWs) to meet performance-based requirements based on available wastewater treatment technology. Under Section 301(b)(1)(B) of the CWA, EPA was required to develop a performance level referred to as “secondary treatment” for POTWs.

Based on this statutory requirement, EPA developed secondary treatment regulations which are specified in 40 CFR Part 133.102. These technology-based regulations apply to all municipal wastewater treatment plants and identify the minimum level of effluent quality attainable by secondary treatment in terms of five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH. Section IV of this Appendix discusses the details of the evaluation for each of these pollutants.

III. Water Quality-based Evaluation

In addition to the technology-based limits discussed above, EPA evaluated the discharge to determine compliance with Section 301(b)(1)(C) of the CWA. This section requires the establishment of limitations in permits necessary to meet water quality standards by July 1, 1977.

The regulations at 40 CFR 122.44(d)(1) implement section 301(b)(1)(C) of the CWA. These regulations require that NPDES permits include limits for all pollutants or parameters which “are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality." These regulations also apply to Tribal water quality standards. The limits must be stringent enough to ensure that water quality standards are met, and must be consistent with any available wasteload allocation (WLA).

In determining whether water quality-based limits are needed and developing those limits when necessary, EPA uses the approach outlined below:

a. Determine the appropriate water quality criteria
b. Determine whether there is "reasonable potential" to exceed the criteria
c. If there is "reasonable potential", develop a WLA
d. Develop effluent limitations based on the WLA

Appendix D provides example calculations for ammonia to illustrate how these steps are implemented.

A. Determine Water Quality Criteria

The first step in developing water quality-based limits is to determine the applicable water quality criteria. The applicable criteria are determined based on the beneficial uses of the receiving water as identified in section III of the Fact Sheet. For any given pollutant, different uses may have different criteria. To protect all beneficial uses, the permit limits are based on the most stringent of the water quality criteria applicable to those uses.

B. Reasonable Potential Evaluation

To determine if there is "reasonable potential" to cause or contribute to an exceedence of the water quality criteria for a given pollutant, EPA compares applicable water quality criteria to the maximum projected downstream concentrations for a particular pollutant, C_d. If the projected downstream concentration exceeds the criteria, there is "reasonable potential" and a water quality-based effluent limit must be included in the permit.

EPA used the recommendations in Chapter 3 of the *Technical Support Document for Water Quality-based Toxics Control* (TSD) to conduct this "reasonable potential" analysis for the City of Puyallup WWTP.

The maximum projected downstream concentration, C_d, is determined using the following mass balance equation.

$C_d = \underline{(C_e \times Q_e) + (C_u \times Q_u)}$

$$Q_d$$

where,

C_d = receiving water concentration downstream of the effluent discharge (at the edge of the mixing zone)
C_e = maximum projected effluent concentration
= maximum reported effluent value x reasonable potential multiplier
Q_e = design flow
C_u = upstream concentration of pollutant
Q_u = upstream flow
Q_d = receiving water flow downstream of the effluent discharge
= $Q_e + Q_u$

Substituting the equality:

$$D = \frac{(Q_u + Q_e)}{Q_e}$$

where,

D = dilution factor

the equation becomes:

$$C_d = \frac{(C_e - C_u)}{D} + C_u$$

For some of the metals of concern, the aquatic life water quality criteria are expressed as dissolved (copper, lead, and zinc). Effluent concentrations are expressed as total recoverable metals. The dissolved metal is the concentration of an analyte that will pass through a 0.45 micron filter. Total metal is the concentration of an analyte in an unfiltered sample. To account for the differences between total effluent concentrations and dissolved criteria, “translators” are used in the reasonable potential (and permit limit derivation) equations. Additional discussion on the translators is provided in Section IV of this appendix. Pollutant Specific Analysis of this appendix. In order to compare metals with criteria expressed as dissolved, the downstream concentration must be converted to the dissolved fraction via the translator.

$$C_d \text{ (dissolved)} = \frac{C_d \text{ (total)}}{\text{translator}}$$

Paragraphs 1 through 3 below discuss each of the factors used in the mass balance equation to calculate C_d.

1. Effluent Concentration

   The maximum projected effluent concentration (C_e) in the mass balance equation is based on the 99th percentile, calculated using the statistical approach recommended in the TSD. The 99th percentile effluent concentration is calculated by multiplying the maximum reported effluent concentration by a reasonable potential multiplier.

   The reasonable potential multiplier accounts for uncertainty in the data. The multiplier decreases as the number of data points increases and variability of the data decreases. Variability is measured by the coefficient of variation (CV) of the data. When there are not enough data to reliably determine a CV, the TSD recommends using 0.6 as a default value. A partial listing of reasonable potential multipliers can be found in Table 3-1 of the TSD.

   Maximum reported effluent concentrations, CVs, and RPMs used in the reasonable potential calculations were based on data collected by the City (DMR data and other monitoring) since January 1996. The mercury evaluation also included clean testing performed by the City in 1995.

2. Upstream (Ambient) Concentration

   The ambient concentration in the mass balance equation is based on a reasonable worst-case estimate of the pollutant concentration upstream from the City of Puyallup’s discharge. For criteria that are expressed as maxima (for example, copper, ammonia), the 95th percentile of the ambient data is generally used as an estimate of worst-case. For criteria that are expressed as minima (for example, dissolved oxygen) the 5th percentile of the ambient data is generally used as an estimate of worst-case. These percentiles were calculated based on data obtained from Ecology’s River and Stream Water Quality Monitoring Program (Station 10A070) and data collected as part of the TMDL report (River Mile 8.3) (Ecology, 1993). Because of changes to collection and analytical methods, metals data collected prior to May 1994 were not included in the evaluation.

3. Dilution

Under the Tribe's water quality standards, dischargers are not authorized to use the entire upstream flow for dilution of their effluent. Instead, the standards contain the following restrictions on mixing zones for determining compliance with chronic criteria:

> *The size may be up to 300 feet plus the horizontal length of the diffuser downstream, 100 feet upstream, and 25 percent of the width of the river at the 7Q10[1] flow;*
>
> *The mixing zone may not be more than 25 percent of the volume of the 7Q10 flow.*

The Tribe's water quality standards require that the acute mixing zone be the same width and 10 percent of the length of the chronic mixing zone. In addition, the acute mixing zone is limited to 10 percent of the volume of the chronic mixing zone, or 2.5 percent of the 7Q10 flow.

The 1996 Facility Plan for the treatment plant (Gray and Osborne, 1996) provided the dilution factors under these conditions. These factors, which were used in calculating the water-quality based effluent limits, are summarized in Table C-1.

Table C-1: Dilution Factors at Critical Mixing Conditions

Mixing Zone	Dilution Factor	River Flow Conditions	Percent of River Flow Available for Effluent Mixing	Effluent Flow (mgd)[1]
Acute aquatic life	1.8	7Q10 (757 cfs)	2.5%	16.0
Chronic aquatic life	11.5	7Q10 (757 cfs)	25%	11.6

Note:
1 Flow includes Microchip flow of 1.88 mgd.

In accordance with the Puyallup Tribe's water quality standards, only the Tribe may authorize mixing zones. In it's pre-certification, the Tribe authorized a mixing zone for metals (copper, lead, mercury, and zinc), pH, and ammonia. The mixing zone was contingent on annual monitoring of the receiving water that demonstrated attainment of water quality criteria for these parameters. If the Tribe authorizes a different sized mixing zone

[1]The 7Q10 (7-day, 10-year low flow) is the 7-day average low flow that has a 10 percent chance of occurring in any given year. The 7Q10 was calculated based on the Log Pearson Type III distribution using United States Geological Survey (USGS) data. The 7Q10 flow for the Puyallup River is 757 cubic feet per second (cfs).

in its final 401 certification, EPA will recalculate the reasonable potential and effluent limits based on the revised mixing zone. If the Tribe does not authorize a mixing zone in its 401 certification, EPA will recalculate the limits based on meeting water quality criteria at the point of discharge.

After C_d is determined, it is compared to the applicable water quality criterion. If it is greater than the criterion, there is "reasonable potential" and a water quality-based effluent limit is developed for that parameter.

Table C-2 summarizes the data, multipliers, and criteria used to determine "reasonable potential" to exceed criteria for the Puyallup WWTP discharge. When all effluent data for a particular pollutant were below the detection limit (for example, toluene), EPA assumed that there was no reasonable potential.

Table C-2: Reasonable Potential Evaluation[1]

Parameter		**Copper, ug/L**	**Lead, ug/L**	**Mercury, ug/L**	**Zinc, ug/L**	**Temp.°C**	**Ammonia, mg/L**	
							Nov. - April	**May - Oct.**
Maximum Reported Conc.		54[2]	4[2]	0.06	79[2]	23	11.7	9.9
No. of Samples		18	18	33	18	72	14	17
CV		0.77	0.88	0.45	0.66	0.19	0.77	0.92
RPM		2.9	3.3	1.7	2.6	1.2	3.3	3.5
Maximum Projected Effluent Conc (C_e)		159	13.2	0.097	202	26	39	35
Upstream Conc (C_u)		1.03[2]	0.06[2]	0.0088	2.5[2]	15.3	0.05	0.04
Projected Downstream Conc. (C_d)	Acute	76.3[3]	5.05[3]	0.060	101[3]	--	21.4	19.5
	Chronic	12.7[3]	0.83[3]	0.017	18[3]	16	3.4	3.1
Most Stringent Criteria	Acute	3.0[4]	6.3[4]	2.4	24[4]	--	8.3	6.7
	Chronic	2.4[4]	0.25[4]	0.012	22[4]	18	1.6	1.3
Reasonable Potential Exists?		Yes	Yes	Yes	Yes	No	Yes	Yes

Table C-2: Reasonable Potential Evaluation[1]
Notes: 1 With the exception of ammonia, effluent data based on DMR results from January 1996 through December 2001. Mercury data also include 1995 clean sampling results. Ammonia effluent data based on DMR results from June 1999 (after the activated sludge system came on-line) through December 2001. 2 Effluent and upstream concentrations for these metals are expressed as total recoverable metals. 3 The projected downstream concentrations for these metals are expressed as dissolved metals. 4 Criteria for these metals apply as dissolved metals.

C. Wasteload Allocation Development

Once EPA has determined that a water quality-based limit is required for a pollutant, the first step in developing a permit limit is development of a wasteload allocation (WLA) for the pollutant. A WLA is the concentration (or loading) of a pollutant that the permittee may discharge without causing or contributing to an exceedence of water quality standards in the receiving water. WLAs for this permit were calculated in three ways: based on a mixing zone for pH, copper, lead, mercury, and zinc, based on a WLA established as part of a preventative TMDL for ammonia and BOD_5, and based on meeting water quality criteria at “end-of-pipe” for fecal coliform.

1. Mixing zone-based WLA

Where the Tribe authorizes a mixing zone for the discharge, the WLA is calculated as a mass balance, based on the available dilution, background concentrations of the pollutant(s), and the water quality criteria. The mass balance equation is the same as that used to calculate reasonable potential, with the acute or chronic criterion substituted for C_d and the WLA substituted for C_e.

Because acute aquatic life, chronic aquatic life, and human health criteria apply over different time frames and may have different mixing zones, it is not possible to compare them directly to determine which criterion results in more stringent limits. For example, the acute criteria are applied as a one-hour average and have a smaller mixing zone, while the chronic criteria are applied as a four-day average and have a larger mixing zone. To allow for comparison, the acute, chronic, and human health WLAs are statistically converted to long-term average WLAs. The most stringent long-term average WLA resulting from these conversions is used to calculate the permit limits.

2. TMDL-based WLA

Where the receiving water quality does not meet water quality standards, the WLA is generally based on a TMDL developed by the state or EPA. A TMDL is a determination of the amount of a pollutant, from point, nonpoint, and natural background sources, including a margin of safety, that may be discharged to a water body without causing the water body to exceed the criterion for that pollutant. Any loading above this capacity would violate water quality standards. Section 303(d) of the CWA requires states to develop TMDLs for waterbodies that will not meet water quality standards after the imposition of technology-based effluent limitations, to ensure that these waters will come into compliance with water quality standards.

The first step in establishing a TMDL is to determine the assimilative capacity (the loading of pollutant that a water body can assimilate without exceeding water quality standards), accounting for seasonal variation, if appropriate. The next step is to divide the assimilative capacity into allocations for non-point sources (called load allocations), point sources (called WLAs), natural background loadings, and a margin of safety to account for any uncertainties. Permit limitations are then developed for point sources that are consistent with the WLAs.

Ecology established a seasonal preventative TMDL for ammonia and BOD_5 for the Puyallup River basin and tributaries effective May 1 through October 31 (Ecology, 1993 and 1994). This preventative TMDL was used in establishing the limits for BOD_5 and ammonia in the draft permit. (See Section IV.A of Appendix C for details.)

3. “End-of-Pipe” WLA

In some cases, there is no dilution available. For example, the Tribe may decide not to authorize a mixing zone for a particular pollutant, or the receiving water may exceed the criterion for a particular pollutant, leaving no “clean” upstream water available for dilution. When there is no dilution, the criterion becomes the WLA.

D. Permit Limit Derivation

Once the WLA has been developed, EPA applies the statistical permit limit derivation approach described in Chapter 5 of the TSD to obtain daily maximum and monthly average permit limits. This approach takes into account effluent variability (through the CV), sampling frequency, and the difference in time frames between the monthly average and daily maximum limits.

The daily maximum limit is based on the CV of the data and the probability basis, while the monthly average limit is dependent on these two variables and the monitoring frequency. As recommended in the TSD, EPA used a probability basis of 95 percent for monthly average limit calculation and 99 percent for the daily maximum limit calculation. As with the reasonable potential calculation, when there were not enough data to calculate a CV, EPA assumed a CV of 0.6 for both monthly average and daily maximum calculations. Where limits were necessary for specific pollutants, the CVs in Table C-1 were used. Appendix D provides an example permit limit calculation.

E. Antidegradation

In addition to water quality-based limitations for pollutants that could cause or contribute to exceedences of numeric or narrative criteria, EPA must consider the Tribe's antidegradation policy. This policy is designed to protect existing water quality when the existing quality is better than that required to meet the standard and to prevent water quality from being degraded below the standard when existing quality just meets the standard.

For waters that are at the level of the standard (known as "Tier 1" waters), the antidegradation policy requires that water quality standards continue to be met. For waters with better quality than the standards (known as "high quality" or "Tier 2" waters), antidegradation requires that no lowering of water quality be allowed unless the Tribe finds that allowing lower water quality is necessary to accommodate important economic or social development before any lowering of water quality is authorized. The Tribe may also designate waters as "Tier 3," in which case no lowering of water quality is allowed.

The Tribe has no implementation guidance for their antidegradation policy. Therefore, the Puyallup River in the vicinity of the City's discharge has not been assigned to any tier. However, the limits in the permit ensure that uses are protected and water quality standards are met.

IV. Pollutant-specific Analysis

This section outlines the basis for each of the effluent limitations in the City of Puyallup's draft permit.

A. Biochemical Oxygen Demand

The federal regulations at 40 CFR 133.102(a)(1)-(3) specify technology-based requirements for BOD_5 for POTWs. These requirements are based on the effluent quality attainable by secondary treatment and are equal to the following:

Monthly Average Concentration:	30 mg/L
Weekly Average Concentration:	45 mg/L
Monthly Average Percent Removal:	85% Minimum

The technology-based concentration and percent removal limits have been incorporated into the draft permit for BOD_5.

Under 40 CFR 122.45(f), permits must contain mass-based limitations. The concentration requirements may be converted to mass limits by multiplying the technology-based concentrations times the design flow (13.98 mgd) and a conversion factor of 8.34. The resulting monthly and weekly average loadings are 3,498 lbs/day and 5,247 lbs/day respectively. As discussed below, these loading limits are less stringent than water quality-based BOD_5 loading limits. Therefore, loading limits in the draft permit are water quality-based.

Ecology developed a preventative TMDL for BOD_5 and ammonia throughout the Puyallup River basin and tributaries effective May 1 through October 31 (Ecology, 1993 and 1994). The WLA for BOD_5 established for the Puyallup WWTP discharge is a maximum weekly average of 2,085 lbs/day. This value has been incorporated directly into the draft permit as the maximum weekly average loading limit. The maximum monthly loading limit is derived from this value based on a factor of 1.5.

Table C-3 outlines the BOD_5 limits in the draft permit. The draft limits are the same as the limits in the 1994 permit. Since the 1999 upgrade, BOD_5 effluent levels for the Puyallup WWTP have been well below these limits.

Table C-3: BOD_5 Draft Limits

	Concentration (mg/L)	**Loading (lb/day)**	**Minimum Percent Removal (%)**
Average Monthly	30	1,390	85
Average Weekly	45	2,085	—

The preventative TMDL also provides an option for dischargers to reduce the WLA for ammonia in order to increase the WLA for BOD_5, since both parameters together influence dissolved oxygen. For each pound of ammonia reduction, the WLA for BOD_5 may increase by 13.4 lb/day. The net effect of this exchange in the allocation is considered negligible.

B. Total Suspended Solids

The federal regulations at 40 CFR 133.102(a)(1)-(3) specify technology-based requirements for TSS for POTWs. These requirements are based on the effluent quality attainable by secondary treatment and are equal to the following:

Monthly Average Concentration: 30 mg/L
Weekly Average Concentration: 45 mg/L

Monthly Average Percent Removal 85% Minimum

These technology-based concentration and percent removal limits have been incorporated into the TSS draft permit limits.

The concentration requirements may be converted to mass limits by multiplying the concentrations times the design flow (13.98 mgd) and a conversion factor of 8.34. The resulting monthly and weekly average loadings are 3,498 lbs/day and 5,247 lbs/day respectively. These limits are less stringent than those in the 1994 permit. The Tribe has expressed concern that the TSS limits should accurately reflect what the facility can achieve. In addition, the City, requested that the TSS mass-based limits be based on 85% removal of the TSS design load. The TSS design loading of the upgraded treatment plant is 15,550 lbs/day. Assuming 85 percent removal of the influent TSS, and applying a 1.5 factor to convert from the maximum monthly loading to the maximum weekly loading, results in the following TSS mass-based limits:

Maximum Monthly Average 2,333 lbs/day
Maximum Weekly Average 3,499 lbs/day

These limits have been incorporated into the draft permit. Table C-4 outlines the TSS limits in the draft permit.

Table C-4: TSS Draft Limits

	Concentration (mg/L)	Loading (lb/day)	Minimum Percent Removal (%)
Average Monthly	30	2,333	85
Average Weekly	45	3,499	—

C. Fecal Coliform Bacteria

The Puyallup Tribe’s water quality standards state that the geometric mean of fecal coliform bacteria may not exceed 100 colonies/100 ml and no more than 10 percent of the samples used to calculate the mean may exceed 200 colonies/100 ml.

Fecal coliform counts in the Puyallup River upstream of the City’s discharge sometimes exceed these criteria. When the upstream water quality exceeds the criteria, there is no “clean” water to mix with the discharge to enable the water to meet the criterion downstream. As a result, the discharge must meet the criteria at the point of discharge. The criteria have been incorporated directly into the draft permit as a monthly average limit and a requirement that no more than 10 percent of samples exceed 200/100 ml.

D. Total Ammonia (as N)

Low concentrations of ammonia can be toxic to freshwater fish, particularly salmonids. Un-ionized ammonia (NH_3) is the principal toxic form of ammonia. The ammonium ion (NH_4^+) is much less toxic. The relative percentages of these two forms of ammonia in the water vary as the temperature and pH vary. As the pH and temperature increase, the percentage of ammonia that is in the un-ionized form increases, causing increased toxicity.

Because the toxicity of ammonia is dependent upon pH and temperature, the criteria are also pH and temperature dependent (EPA, 1999). At the request of the City, seasonal criteria and concentration limits were developed for ammonia. The receiving water pH and temperature and corresponding ammonia criteria are presented in Table C-5. Data for the Puyallup River were from Ecology's River and Stream Water Quality Monitoring Program (Station 10A050) and data collected as part of the TMDL report (River Mile 5.7) (Ecology, 1993). Reasonable worst-case pH and temperature conditions were calculated from the 95th percentile from samples obtained from 1990 through December 2001. Although earlier data exist for the monitoring location (from 1960 to 1981), an analysis of the data indicated that the pH conditions of the river have changed. Therefore, to represent the existing river conditions to which the treatment plant discharges, only the most recent 12 years of data were used.

Table C-5: Ammonia Criteria

Time Period	Receiving Water Conditions[1]		Acute Criteria (mg/L)	Chronic Criteria (mg/L)
	pH	Temperature (°C)		
November to April	7.8	8.8	8.3	1.6
May to October	7.9	15.2	6.7	1.3

Note:
1 Data based on the 95th percentile of the receiving water data collected from 1990 to 2001.

Although it is the un-ionized form that is toxic, the criteria are expressed as total ammonia. As effluent mixes with receiving water, the temperature and pH change, making it difficult to predict how much of the total ammonia in the discharge will convert to the un-ionized form. Therefore, the limits in the draft permit are expressed as total ammonia, not un-ionized ammonia.

Using the statistical permit derivation method in the TSD, EPA calculated seasonal daily maximum and monthly average concentration limits. The limits are listed in Table C-6. Mass-based loadings corresponding to these limits were calculated based on the design flow of 13.98 mgd.

In addition to potential toxicity, ammonia can contribute to dissolved oxygen depression. As discussed in Section A above, Ecology developed a preventative TMDL for ammonia and BOD_5 to address dissolved oxygen concerns in the Puyallup River. The preventative TMDL established a WLA for ammonia for the City's WWTP and allowed conversion of ammonia loading into BOD_5. Based on the preventative TMDL, the draft permit contains a daily maximum limit on ammonia loading of 880 lb/day from May 1 through October 31. This limitation is more stringent than the daily maximum loading limit derived to prevent toxicity. Table C-6 summarizes the ammonia limitations in the draft permit.

Table C-6: Draft Ammonia Limits

Season	Daily Maximum		Monthly Average	
	Concentration (mg/L)	Loading (lb/day)	Concentration (mg/L)	Loading (lb/day)
November 1 - April 30	14.9	1,737	5.8	676
May 1 - October 31	12.0	880	4.2	490

E. Metals

In the Puyallup Tribe's water quality standards, the most stringent criteria for metals other than arsenic are the criteria for the protection of aquatic life. For arsenic, the most stringent criterion is for protection of human health. This section discusses the calculation of the metals criteria and the conversion of these criteria to limits in the draft permit.

1. Criteria calculation

In evaluating whether limits for specific metals were appropriate and in calculating the necessary limits, EPA considered only metals that were detected in the effluent. Table C-7 lists the most stringent criteria for the metals of concern. Except for mercury, the Tribe's aquatic life criteria for these metals are expressed as a function of hardness, measured in milligrams per liter calcium carbonate (mg/L $CaCO_3$). As the hardness of the receiving water increases, the toxicity decreases, and the numerical value of the criteria increases.

At the request of the Puyallup Tribe, the metals criteria were calculated based on the receiving water hardness data. A hardness value of 18 mg/L as $CaCO_3$ was used which represented the 5th percentile from USGS data and data collected as part of the TMDL report. Receiving water hardness data is provided in Appendix F.

In addition to the calculation for hardness, the Tribe's criteria include a "conversion factor" to convert from total recoverable to dissolved criteria. Total recoverable metals analysis measures both the particulate and the dissolved fraction of the metal. Conversion factors address the relationship between the total amount of metal in the water column (total recoverable metal) and the fraction of that metal that causes toxicity (bioavailable metal). Conversion factors are included in Table C-7.

Table C-7: Metals Criteria for the Puyallup River

Parameter		**Conversion Factor**	**Criterion Formula**	**Criterion (:g/l)**	
				Dissolved	**Total**
Copper	Acute	0.862	exp(0.9422*ln[hardness] - 1.464)	3.0	--
	Chronic	0.862	exp(0.8545*ln[hardness] - 1.465)	2.4	--
Lead	Acute	0.687	exp(1.273*ln[hardness] - 1.460)	6.3	--
	Chronic	0.687	exp(1.273*ln[hardness] - 4.705)	0.25	--
Mercury	Acute	N/A[1]	N/A[1]	--	2.4
	Chronic	N/A[1]	N/A[1]	--	0.012
Zinc	Acute	0.891	exp(0.8473*ln[hardness] + 0.8604)	24	--
	Chronic	0.891	exp(0.8473*ln[hardness] + 0.7614)	22	--

Note:
1 The acute and chronic criteria for mercury are not hardness-dependent.

Based on data submitted by the City, the analysis indicated that copper, lead, and mercury show reasonable potential to contribute to exceedences of the chronic criteria at the edge of the chronic mixing zone. In addition, both copper and zinc show reasonable potential to contribute to exceedences of the acute criterion at the edge of the acute mixing zone. Therefore, the draft permit contains limits for these metals.

The 1994 permit included mercury limits of 0.014 ug/L (average monthly) and 0.019 ug/L (maximum daily). The compliance level in the 1994 permit was 0.2 ug/L. During the last six years, the facility has been in compliance with this level. Since 1996, the DMRs reported four detected mercury concentrations (all below 0.2 ug/L). In all other DMRs, mercury values were reported as either "less than 0.2 ug/L" or "0 ug/L."

Because the water quality-based permit limits were below the compliance level, compliance with the water quality based permit limits could not be evaluated directly from the DMR data only. In order to have a more extensive set of detected concentrations to evaluate the reasonable potential for mercury, the EPA considered the results of the clean sampling data from 1995. The data set analyzed for reasonable potential included the four reported concentrations using normal sampling techniques and the 1995 clean sampling results. The results of the reasonable potential evaluation indicated that the mercury would have a reasonable potential to exceed the acute water quality criterion.

2. Permit Limit Calculation

Although the metals criteria are based on dissolved metal, 40 CFR 122.45(c) requires that metal limits be based on total recoverable metals. Changes in water chemistry as the effluent and receiving water mix could cause some of the particulate metal in the effluent to dissolve.

To account for the difference between total recoverable effluent concentrations and dissolved criteria, “translators” are used in calculating effluent limits. “Translators” are based on the fraction of the total recoverable metals that is predicted to be in the dissolved form in the receiving water. The dissolved wasteload allocation is multiplied by the translator, resulting in a total recoverable value. Translators can either be site specific numbers or default numbers. Because there are no site-specific translators for the Puyallup River, translators were calculated as the reciprocal of the conversion factors listed in Table C-7.

Table C-8 summarizes the limits for metals in the draft permit. Mass-based limits were calculated by multiplying the concentration by the treatment plant design flow (13.98 mgd) and a conversion factor of 8.34. Intermediate values from the metal limit calculations are provided in Appendix D.

Table C-8: Metals Limits for the City of Puyallup Draft Permit

Parameter	Monthly Average	Daily Maximum
Copper		
:g/l	3.5	5.5
lbs/day	0.41	0.64
Lead		
:g/l	3.7	6.3
lbs/day	0.43	0.73

Mercury :g/l lbs/day	 0.052 0.006	 0.069 0.008
Zinc :g/l lbs/day	 31 3.6	 47 5.5

F. pH

Under 40 CFR 133.102 effluent pH must be within the range of 6.0 to 9.0 standard units for POTWs. In addition, the Tribe's water quality standards for protection of aquatic life require that ambient pH be in the range of 6.5 to 8.5 standard units.

The statistical approach in the TSD cannot be used to establish reasonable potential for pH. Instead, a model of pH mixing was used to determine the effluent pH values that would result in meeting the criteria at the edge of the mixing zone. Ambient pH is a function of effluent and ambient pH, flow, alkalinity (buffering capacity), and temperature. The worst-case scenario is a warm, highly buffered effluent being discharged into a warm, poorly buffered stream. Table C-9 shows the values used to represent this scenario.

Table C-9: Input Data for Puyallup River pH Model

	Effluent	Upstream
Temperature, ^{O}C	21.4[1]	15.3[2]
pH, Standard Units	6.0 - 9.0	7.0 - 7.8[3]
Alkalinity, mg/L $CaCO_3$	150[4]	24[5]

Notes:
1. Based on the 95th percentile of the DMR data 1996 to 2001.
2. Based on the 95th percentile of USGS data from 1990 to 2001.
3. Range based on the 5th and 95th percentile of USGS and TMDL data from 1990 to 2001.
4. Based on the 95th percentile of WET testing data.
5. Based on the 5th percentile of USGS and TMDL data from 1990 to 2001.

Based on the above data, the model indicated that an effluent pH within the range of 6.2 to 9.0 is required to achieve a pH at the edge of the mixing zone that complies with the Tribe's water quality standard of 6.5 to 8.5. Therefore, the draft permit contains a pH range of 6.2 to 9.0.

G. Total Residual Chlorine

The 1994 permit contained limits on chlorine. However, as part of the 1999 upgrade, the City changed from chlorine to ultraviolet disinfection of its wastewater. Therefore, chlorine limits are no longer necessary.

H. Fluoride

The City has been considering fluoridation of Puyallup's municipal water supply. Further, in April 2002, the Tacoma/Pierce County Health Department mandated fluoridation of all water systems in the county serving more than 5,000 people by January 1, 2004. At the request of the Tribe, the draft permit requires that the City conduct a fluoride toxicity study that addresses effects to salmonids and the most sensitive biota in the lower Puyallup River prior to fluoridation of the municipal water supply.

The EPA conducted a preliminary evaluation of whether the anticipated fluoride levels in the WWTP effluent would have reasonable potential to exceed the water quality criteria based on a literature review. This evaluation, presented as Appendix E, indicated that the anticipated fluoride concentrations in the WWTP effluent would not have reasonable potential to exceed the water quality criteria.

IV. References

EPA, 1999. *1999 Update of Ambient Water Quality Criteria for Ammonia.* EPA-822-R-99-014, December 1999.

APPENDIX D - EFFLUENT LIMIT CALCULATIONS

This appendix steps through an example calculation of permit limits for ammonia during the time period of November through April.

Step 1: Determine the appropriate criteria

1A. Determine the uses

The Puyallup River is protected by the Puyallup Tribe for the following uses: domestic, industrial and agricultural water supply, stock watering, fish and shellfish (including salmonids, crustaceans and other shellfish, and other fish), wildlife habitat, ceremonial and religious water use, commerce, navigation, and primary and secondary recreation.

1B. Determine the most stringent criterion to protect the uses

The most stringent criterion associated with these uses is for protection of salmonid spawning. The criteria for ammonia are based on temperature and pH (see Appendix C, section IV.D). Using reasonable worst-case assumptions for pH and temperature results in the following seasonal acute criterion (CMC) and chronic criterion (CCC):

Table D-1: Ammonia Criteria

Time Period	Receiving Water Conditions[1]		Acute Criteria (mg/L)	Chronic Criteria (mg/L)
	pH	Temperature (°C)		
November to April	7.8	8.8	8.3	1.6
May to October	7.9	15.2	6.7	1.3

Note:
1 Based on the 95th percentile of the receiving water data collected from 1990 to 2001.

Step 2: Determine whether there is "reasonable potential" to exceed the criteria

2A. Determine the "reasonable potential" multiplier

The "reasonable potential" multiplier is based on the CV of the data and the number of data points. The data used are DMR results since the activated sludge system was brought on-line. From November 1999 through December 2001, there are 14 data points during the months of November through April. The calculated CV is 0.77. (See Appendix F for effluent monitoring results.)

Using the equations in section 3.3.2. of the TSD, the reasonable potential multiplier (RPM) is calculated as follows:

$$p_n = (1 - \text{confidence level})^{1/n}$$

where,
p_n = the percentile represented by the highest concentration
n = the number of samples

$p_n = (1-0.99)^{1/14}$
$p_n = 0.72$

This means that the largest value in the data set is greater than the 72nd percentile.

Next, the ratio of the 99th percentile to the 72nd percentile is calculated, based on the equation:

$$C_p = \exp(zF - 0.5F^2)$$

where,
$F^2 = \ln(CV^2 + 1)$
CV = coefficient of variation (= 0.771)
$F^2 = 0.467$

z = normal distribution value
= 2.326 for the 99th percentile
= 0.582 for the 72nd percentile

$C_{99} = \exp(2.326 * 0.683 - 0.5 * 0.467)$
$= 3.88$

$C_{72} = \exp(0.582 * 0.683 - 0.5 * 0.467)$
$= 1.18$

RPM $= C_{99}/C_{72}$
$= 3.88/1.18$

RPM = 3.29

2B. Calculate the concentration of the pollutant at the edge of the mixing zone

There is reasonable potential to exceed criteria if the maximum projected concentration of the pollutant at the edge of the mixing zone exceeds the criterion. The maximum projected concentration is calculated from the following equation:

$$C_d = \frac{C_e - C_u}{D} + C_u$$

where,

C_d = receiving water concentration at the edge of the mixing zone
C_e = maximum projected effluent concentration
= maximum reported effluent concentration * reasonable potential multiplier (11.7 * 3.29 = 38.5 ug/L total)
C_u = upstream concentration of pollutant (0.05 mg/L)
D = dilution factor (1.8 for acute, 11.5 for chronic)

For the acute criterion,

$$C_d = \frac{38.5 - 0.05}{1.8} + 0.05$$

$$\mathbf{C_d = 21.4\ mg/L}$$

For the chronic criterion,

$$C_d = \frac{38.5 - 0.05}{11.5} + 0.05$$

$$\mathbf{C_d = 3.40\ mg/L}$$

The concentrations at the edges of the acute and chronic mixing zones are greater than the criteria, therefore a limit must be included in the permit.

Step 3: Calculate the wasteload allocations

Wasteload allocations (WLAs) are calculated using the same mass balance equation used to calculate the concentration of the pollutant at the edge of the mixing zone. However, C_d becomes the acute or chronic criterion and C_e is replaced by the acute or chronic WLA. The equation is rearranged to solve for the WLA, becoming:

$$WLA_a = D*(CMC - C_u) + C_u$$

For the acute criterion,

$$WLA_a = 1.8 * (8.3 - 0.05) + 0.05$$

$$\mathbf{WLA_a = 14.9\ mg/L}$$

For the chronic criterion

$$WLA_c = 11.5 * (1.6 - 0.05) + 0.05$$

WLA_c = 17.9 mg/L

The WLAs are converted to long-term average concentrations, using the following equations from EPA's *Technical Support Document for Water Quality-based Toxics Control* (TSD):

$$LTA_a = WLA_a * \exp[0.5F^2 - zF]$$

$$LTA_c = WLA_c * \exp[0.5F_4^2 - zF_4]$$

where,

F_4^2 = $\ln(CV^2/4 + 1)$
= 0.139
z = 2.326 for 99th percentile probability basis

LTA_a = 14.9 * exp[0.5 *0.467 - 2.326 *0.683]

LTA_a = 3.8 mg/L (November through April)

LTA_c = 17.9 * exp[0.5 * 0.139 - 2.326 *0.372]

LTA_c = 8.1 mg/L (November through April)

The LTAs are compared and the more stringent is used to develop the daily maximum and monthly average permit limits. In this case, the acute LTA is more stringent.

Using the above equations with the acute and chronic criteria, the corresponding LTA's for the time period from May through October are: LTA_a = 2.6 mg/L; LTA_c= 5.8 mg/L.

<u>Step 4</u>: Derive the maximum daily (MDL) and average monthly (AML) permit limits

Example calculations for Step 4 are provided for the November through April time period. Using the TSD equations, the MDL and AML permit limits are calculated as follows:

$$MDL = LTA * \exp[zF - 0.5F^2]$$

where:
z = 2.326 for 99th percentile probability basis

MDL= 3.84 * exp[2.326 * 0.683 - 0.5 *0.467]

MDL= 14.9 mg/L

AML= LTA * exp[zF_n - 0.5F_n^2]

where:

F_n^2 = ln(CV^2/n + 1)
= 0.072
z = 1.645 for 95th percentile probability basis
n = number of sampling events required per month (8)

AML= 3.84 * exp[1.645 * 0.268 - 0.5 *0.072]

AML= 5.8 mg/L

Similarly, the MDL and AML for time period for May through October are calculated as: MDL = 12.0 mg/L; AML = 4.2 mg/L

The mass-based limits corresponding to these concentrations are calculated based on the concentration limits and the wastewater treatment plant design flow of 13.98 mgd, and a conversion factor of 8.34.

From November to April:

Mass-based MDL = 14.9 mg/L x 13.98 mg/L x 8.34 = 1,737 lbs/day
Mass-based AML = 5.8 mg/L x 13.98 mg/L x 8.34 = 676 lbs/day

Similarly, the mass-based AML from May to October is calculated to be 490 mg/L. As discussed in Appendix C Section IV.D, the mass-based MDL from May to October is based on the preventative TMDL WLA of 880 lbs/day.

APPENDIX E - FLUORIDE TOXICITY ANALYSIS

I. Introduction

The City has been considering fluoridation of Puyallup's municipal water supply. Further, in April 2002, the Tacoma/Pierce County Health Department mandated fluoridation of all water systems in the county serving more than 5,000 people by January 1, 2004. This appendix presents a preliminary evaluation of whether the anticipated fluoride levels in the WWTP effluent would have reasonable potential to exceed the water quality criteria based on a literature review of fluoride toxicity studies. At the request of the Tribe, the draft permit requires that the City conduct a fluoride toxicity study that addresses effects to salmonids and the most sensitive biota in the lower Puyallup River prior to fluoridation of the municipal water supply.

II. Water Quality Criteria

A. Tribal Water Quality Standards

The Puyallup River is protected by the Puyallup Tribe for the following uses: domestic, industrial and agricultural water supply, stock watering, fish and shellfish (including salmonids, crustaceans and other shellfish, and other fish), wildlife habitat, ceremonial and religious water use, commerce, navigation, and primary and secondary recreation.

The Tribe has no numeric fluoride criteria. In the absence of numeric criteria, the Tribe's narrative criteria can be the basis for limiting specific pollutants. The Tribe's water quality standards have the following narrative criterion for toxic substances:

> *Section 5 (1) Toxic substances shall not be introduced above natural background levels in surface waters of the Puyallup Tribe which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those water, or adversely affect public health, as determined by the Department.*

B. Federal Standards

There are no federal numeric water quality criteria for fluoride for the protection of aquatic life. There is a maximum contaminant level for fluoride in drinking water of 4.0 mg/L.

C. Literature Review

Several studies have investigated the effects of fluoride on aquatic life. Based on a review of these studies, this evaluation has determined the appropriate protective level of fluoride to be 0.4 mg/L. This level is based primarily on a study which investigated the impact of fluoride concentrations released from an aluminum plant at the John Day Dam on the Columbia River. The results of the study suggested that fluoride concentrations of 0.5 mg/L could have behavioral impacts on the upstream migration of salmon through a flume. The study provided results of a two-choice flume experiment, in which significantly more salmon selected the non-fluoride flume over a flume with a fluoride concentration of 0.5 mg/L. A fluoride concentration of 0.2 mg/L of fluoride, had no observable affect on the salmon's behavior. (Damkaer and Dey, 1989).

The toxic effects of fluoride on aquatic life are influenced by abiotic factors (e.g., hardness and temperature) and biotic factors (e.g., development state, size, and type of species). The toxicity increases with decreased hardness and increased temperature.

Studies investigating the toxicity of fluoride to aquatic life provide variable results. One study looked at the mortality of rainbow trout over a 96-hour period in waters of various hardness levels. The 96-hour, LC_{50} values were reported to be 51 and 128 mg/L for waters with hardness levels of 17 and 49 mg/L mg/L as $CaCO_3$ respectively (Pimentel and Bulkley, 1983). (The calculated hardness levels at the edge of the chronic and acute mixing zones for the Puyallup WWTP are 26 and 45 mg/L as $CaCO_3$ respectively.) In another study on rainbow trout conducted at low hardness levels (10 mg/ L as $CaCO_3$), the LC_{50} ranged between 2.7 to 4.7 mg/L of fluoride (Neuhold and Sigler, 1960). A study on the growth and reproduction of *Daphnia Magna* (water flea) estimated a safe fluoride level in hard waters (250 mg/L as $CaCO_3$) to be 4.4 mg/L (Dave, 1984).

III. Analysis

A. Effluent Concentration

A worse-case maximum fluoride effluent concentration of 0.9 mg/L was assumed for this evaluation based on the anticipated influent fluoride concentrations and treatment. If the City were to fluoridate, the concentration of the fluoride in the drinking water would be in the range of 1.0 to 1.2 mg/L. There are other sources of fluoride that can contribute to fluoride concentrations in the wastewater treatment plant influent, such as fluoridated toothpaste and some foods. At the same time, removal of more than 50 percent of the influent fluoride concentration would be anticipated through secondary treatment (Masuda, 1964).

Based on the distribution of fluoride concentrations from 29 wastewater treatment plants, the average effluent fluoride concentration from secondary treatment plants was 0.6 mg/L, with a 95% confidence that the mean concentration was between 0.4 to 0.9 mg/L (Masuda, 1964).

B. Background Concentration

Fluoride occurs naturally in many waters, especially in the western United States. Surface waters usually contain 0.1 mg/L or less of naturally occurring fluoride and levels of 0.3 to 2.1 mg/L have been linked to specific sources discharging into rivers and streams. However, some waterbodies have shown elevated levels of naturally occurring fluorides.

In the absence of reported fluoride concentrations in the Puyallup River, the receiving water concentration was assumed to have a fluoride concentration of 0.1 mg/L.

C. Concentration at Edge of Mixing Zone

Using a chronic dilution factor of 11.5, results in receiving water concentration at the edge of the chronic mixing zone of 0.2 mg/L. This concentration is lower than the assumed protective level of 0.4 mg/L. Based on the assumptions of this analysis, fluoride would not have reasonable potential to violate the Tribe's water quality standards.

IV. Fluoride References

Angelovic JW, Sigler WF, Neuhold JM. Temperature and fluorosis in Rainbow trout. Journal. *Water Pollution Control Federation* 33:371-381 1961.

Neuhold JM, Sigler WF. *Effects of sodium fluoride on carp and Rainbow trout. Transactions. American Fisheries Society* 89:358-370 1960.

Pimentel R. Bulkley RB. Influence of-water hardness on fluoride toxicity to Rainbow trout. *Environmental Toxicology and Chemistry* 2:381-386 1983.

Damkaer DM, Dey DB. Evidence for fluoride effects on salmon passage at John Day Dam, Columbia River, 1982-1986. *North American Journal of Fisheries Management* 9:154-162 1989.

Ellis MM, Westfall BA, Ellis MD. *Determination of Water Quality Research Report 9*. Fish and Wildlife Service, Department of Interior, Washington DC 1948 pp 81-82.

Dave G. Effects of fluoride on growth reproduction and survival in Daphnia magna. *Comparative Biochemistry and Physiology 78c* (2) 425-431 1984.

Masuda TT. Persistence of fluoride from organic origins in waste waters. *Developments in Industrial Microbiology 5* 53-70 1964.

APPENDIX F - MONITORING DATA

Puyallup River
Receiving Water pH

Date	pH	Data Source
9/18/90	7.7	(1)
9/18/90	7.8	(1)
9/18/90	7.8	(1)
9/19/90	7.5	(1)
9/19/90	7.5	(1)
9/20/90	8	(1)
9/21/90	7.9	(1)
9/27/90	7.5	(1)
9/28/90	7.6	(1)
10/2/90	7.6	(1)
10/2/90	7.5	(1)
10/2/90	7.6	(1)
10/3/90	7.6	(1)
10/3/90	7.6	(1)
10/4/90	7.9	(1)
10/4/90	7.8	(1)
10/4/90	7.8	(1)
10/5/90	7.6	(1)
11/15/00	7.51	
12/6/00	7.27	
1/24/01	7.7	
2/28/01	7.42	
3/21/01	7.8	
4/18/01	7.61	
11/27/01	7.41	
12/11/01	7.4	
18-Jul-01	7.51	
18-Oct-00	7.52	
19-Sep-01	7.54	
20-Jun-01	7.5	
22-Aug-01	7.45	
23-May-01	7.68	
30-Oct-01	7.25	

Puyallup River
Receiving Water Temperature (deg. C)

Date	Temp.	Data Source
09/18/90	15.2	(1)
09/18/90	12.9	(1)
09/18/90	15.2	(1)
09/19/90	14.3	(1)
09/19/90	14.3	(1)
09/20/90	14.2	(1)
09/21/90	12.7	(1)
09/27/90	16.4	(1)
09/28/90	12.6	(1)
10/02/90	14	(1)
10/02/90	10.4	(1)
10/02/90	14	(1)
10/03/90	14.2	(1)
10/03/90	14.2	(1)
10/04/90	12.7	(1)
10/04/90	12.6	(1)
10/04/90	12.2	(1)
10/05/90	10.2	(1)
10/18/00	11	
05/23/01	14.4	
06/20/01	14.5	
07/18/01	12.7	
08/22/01	12.5	
09/19/01	12.3	
10/30/01	9	
11/15/00	4.5	
12/06/00	4.1	
01/24/01	5.1	
02/28/01	4.5	
03/21/01	7	
11/27/01	6.3	
12/11/01	5.3	
04/18/01	9.8	

Data Sources:
(1) 1990 Puyallup River TMDL Study (River Mile 5.7)
Data source is USGS unless otherwise indicated (River Mile 5.8)

Puyallup River
Receiving Water Hardness (mg/L as CaCO3)

Date	Hardness
10/4/60	33
11/4/60	24
11/30/60	22
1/3/61	31
2/2/61	20
3/6/61	27
4/19/61	24
5/3/61	21
6/6/61	16
7/5/61	20
8/3/61	20
9/6/61	26
11/8/61	29
2/7/62	22
5/7/62	19
8/14/62	26
11/15/62	33
1/6/63	19
5/3/63	24
8/13/63	20
11/15/63	24
2/25/64	24
5/20/64	17
8/27/64	18
11/28/64	22
2/25/65	22
5/5/65	22
8/4/65	22
10/5/65	31
11/3/65	30
12/14/65	40
1/11/66	26
2/1/66	35
3/15/66	28
4/11/66	19
11/3/66	26
11/18/68	22
1/13/69	23
2/10/69	28
3/17/69	26
4/8/69	22
5/12/69	17
6/16/69	18
7/14/69	22
8/11/69	21
9/15/69	34
10/13/69	25

Date	Hardness
11/11/69	36
12/8/69	27
1/12/70	27
2/9/70	22
3/9/70	25
4/6/70	25
5/11/70	22
6/8/70	18
7/20/70	19
8/10/70	27
9/8/70	24
11/17/70	23
12/1/70	27
12/14/70	24
1/25/71	18
2/8/71	24
2/22/71	27
3/8/71	31
4/26/71	25
5/10/71	20
5/25/71	19
6/22/71	19
7/12/71	20
7/26/71	23
8/9/71	25
8/23/71	26
9/13/71	24
9/27/71	30
10/6/71	31
10/28/71	39
11/4/71	44
11/22/71	30
12/9/71	18
12/22/71	25
1/5/72	23
1/19/72	24
2/3/72	24
2/16/72	17
3/8/72	16
3/22/72	18
4/5/72	20
4/19/72	23
5/3/72	23
5/17/72	14
6/7/72	17
6/21/72	19
7/6/72	20

Date	Hardness
7/19/72	21
8/2/72	25
8/16/72	25
9/7/72	34
9/20/72	30
10/17/74	48
10/30/74	41
1/15/75	22
1/29/75	23
2/20/75	24
2/26/75	25
3/12/75	26
3/26/75	37
4/16/75	33
4/30/75	28
5/14/75	19
5/28/75	19
6/11/75	18
6/25/75	22
7/16/75	20
7/30/75	19
8/14/75	31
8/27/75	29
9/4/75	25
9/17/75	24
10/15/75	28
10/21/75	22
11/4/75	26
11/18/75	25
12/2/75	17
12/16/75	24
1/13/76	29
1/27/76	22
2/3/76	25
2/18/76	30
3/2/76	25
3/17/76	28
4/6/76	25
4/20/76	26
5/4/76	22
5/18/76	22
6/2/76	23
6/15/76	20
7/7/76	18
7/20/76	17
8/3/76	22
8/17/76	24

Date	Hardness
9/8/76	23
9/28/76	25
10/13/76	25
10/27/76	24
11/10/76	25
11/18/76	20
12/8/76	30
12/22/76	35
1/13/77	27
1/26/77	25
2/3/77	25
2/23/77	26
3/16/77	28
3/31/77	25
4/13/77	20
4/27/77	20
5/11/77	23
5/25/77	24
6/15/77	19
6/29/77	19
7/7/77	24
7/20/77	23
8/3/77	22
8/17/77	19
9/8/77	20
9/21/77	24
1/25/78	27
2/28/78	30
3/28/78	28
4/26/78	25
5/31/78	27
6/28/78	25
8/1/78	23
8/30/78	24
9/28/78	28
10/26/78	37
11/27/78	29
12/27/78	32
1/30/79	30
2/28/79	28
3/29/79	26
4/30/79	21
5/30/79	22
6/28/79	19
8/6/79	22
9/6/79	30
9/27/79	28

Date	Hardness	Source
10/31/79	35	
12/3/79	24	
12/19/79	25	
2/4/80	23	
3/4/80	22	
4/1/80	26	
4/30/80	21	
6/19/80	20	
8/6/80	25	
8/28/80	21	
10/27/80	29	
1/13/81	26	
3/2/81	27	
5/18/81	26	
09/18/90	30.3	(1)
10/02/90	24.7	(1)
10/03/90	26.9	(1)

Data Sources:
(1) 1990 Puyallup River TMDL Study (River Mile 5.7)
Data source is USGS unless otherwise indicated (River Mile 5.8)

Upstream Temperature (deg. C)

Date	Temp.
01/31/90	4.1
02/28/90	3.9
03/28/90	8.5
04/25/90	8.7
05/31/90	10.7
06/27/90	13.5
07/31/90	14.1
08/29/90	16.1
09/26/90	14.2
10/31/90	9.1
11/28/90	6.3
12/19/90	2
01/30/91	2.9
02/27/91	5.8
03/27/91	6.2
04/24/91	9.2
05/29/91	10.9
06/26/91	12
07/31/91	14.4
08/28/91	13.8
09/25/91	11.5
10/30/91	8
11/20/91	7
12/18/91	4.5
01/29/92	6.4
02/26/92	6.8
03/25/92	9.3
04/29/92	11.8
05/27/92	13.4
06/24/92	15.9
07/29/92	14.1
08/26/92	13.2
09/30/92	13
10/27/92	10.4
11/22/92	6.9
12/21/92	4.3
01/26/93	6.6
02/23/93	2.9
03/23/93	7.1
04/27/93	9
05/25/93	12.5
06/29/93	12.3
07/27/93	15.9
08/24/93	13
09/28/93	11.6
10/27/93	10.5
11/22/93	5.1

Date	Temp.
12/21/93	3.5
01/26/94	5.6
02/23/94	4.1
03/30/94	7.7
04/27/94	8.6
05/25/94	13.6
06/29/94	14.8
07/27/94	15.8
08/24/94	14.2
09/28/94	12.8
10/17/94	8.6
11/14/94	7.1
12/19/94	5.2
01/16/95	4.7
02/20/95	6.4
03/20/95	7.3
04/17/95	8.5
05/15/95	12.9
06/19/95	12.6
07/17/95	16.8
08/21/95	14.9
09/18/95	13.2
10/18/95	10.6
11/21/95	7.3
12/19/95	6
01/24/96	4.8
02/21/96	5.7
03/20/96	7.7
04/24/96	8.3
05/22/96	10.2
06/19/96	12.9
07/24/96	17.9
08/21/96	14.8
09/18/96	9.8
10/23/96	7.5
11/20/96	3.5
12/17/96	4.5
01/22/97	5.1
02/19/97	4.6
03/19/97	6.6
04/23/97	7.8
05/21/97	9.1
06/18/97	11
07/23/97	13.1
08/20/97	14.2
09/23/97	15.3
10/22/97	9.2

Date	Temp.
11/19/97	6.7
12/17/97	5.3
01/21/98	3.4
02/19/98	5.3
03/18/98	5.6
04/22/98	9.6
05/20/98	10
06/24/98	11.8
07/22/98	15.5
08/19/98	10.8
09/23/98	12.5
10/21/98	9.1
11/18/98	6.4
12/16/98	5.5
01/20/99	5
02/17/99	4.5
03/24/99	7.1
04/21/99	7.8
05/26/99	9.3
06/23/99	9.7
07/21/99	12.4
08/18/99	14.4
09/22/99	13.4
10/20/99	9.7
11/03/99	5.4
12/08/99	4.4
01/19/00	1.9
02/16/00	0
03/22/00	5.4
04/19/00	8.5
05/17/00	9.2
06/21/00	10.9
07/19/00	12.5
08/23/00	15.2
09/20/00	12.4
10/18/00	10.9
11/15/00	4.5
12/06/00	4.1
01/24/01	5.1
02/28/01	4.3
03/21/01	7.4
04/18/01	9.5
05/23/01	14.3
06/20/01	14.3
07/18/01	14
08/22/01	12.4
09/19/01	12.2

Data Source: USGS (River Mile 8.3)

Puyallup River
Upstream NH3 (mg/L)

Date	NH3 Total (as N)	Data Source
1/31/90	0.06	
2/28/90	0.03	
3/28/90	0.02	
4/25/90	0.02	
5/31/90	0.03	
6/27/90	0.02	
7/31/90	0.04	
8/29/90	0.03	
9/18/90	0.021	(1)
9/19/90	0.039	(1)
9/26/90	0.01	
10/2/90	0.016	(1)
10/3/90	0.034	(1)
10/31/90	0.03	
11/28/90	0.02	
12/19/90	0.03	
1/30/91	0.03	
2/27/91	0.02	
3/27/91	0.03	
4/24/91	0.02	
5/29/91	0.01	
6/26/91	0.01 U	
7/31/91	0.03	
8/28/91	0.04	
9/25/91	0.03	
10/30/91	0.02	
11/20/91	0.04	
12/18/91	0.03	
1/29/92	0.05	
2/26/92	0.02	
3/25/92	0.03	
4/29/92	0.03	
5/27/92	0.01	
6/24/92	0.03	
7/29/92	0.04	
8/26/92	0.04	
9/30/92	0.02	
10/27/92	0.019	
11/22/92	0.039	
12/21/92	0.059	
1/26/93	0.067	
2/23/93	0.027	
3/23/93	0.045	
4/27/93	0.03	
5/25/93	0.033	
6/29/93	0.037	
7/27/93	0.018	
8/24/93	0.017	

Date	NH3 Total (as N)
9/28/93	0.019
10/27/93	0.017
11/22/93	0.1
12/21/93	0.033
1/26/94	0.039
2/23/94	0.039
3/30/94	0.01
4/27/94	0.016
5/25/94	0.01 U
6/29/94	0.053
7/27/94	0.01 U
8/24/94	0.01 UJ
9/28/94	0.024
10/17/94	0.01 U
11/14/94	0.026
12/19/94	0.01 U
1/16/95	0.019
2/20/95	0.045
3/20/95	0.01 U
4/17/95	0.015
5/15/95	0.027
6/19/95	0.023
7/17/95	0.015
8/21/95	0.01 U
9/18/95	0.038
10/18/95	0.01 U
11/21/95	0.021
12/19/95	0.023
1/24/96	0.03
2/21/96	0.01 U
3/20/96	0.01 U
4/24/96	0.036
5/22/96	0.013
6/19/96	0.01 U
7/24/96	0.01 U
8/21/96	0.012
9/18/96	0.01 U
10/23/96	0.01 U
11/20/96	0.023
12/17/96	0.039
1/22/97	0.029
2/19/97	0.013
3/19/97	0.038
4/23/97	0.032
5/21/97	0.019
6/18/97	0.01 UJ
7/23/97	0.01 U
8/20/97	0.016

Date	NH3 Total (as N)
9/23/97	0.019
10/22/97	0.01 U
11/19/97	0.015
12/17/97	0.038
1/21/98	0.019
2/19/98	0.011
3/18/98	0.01 U
4/22/98	0.027
5/20/98	0.02
6/24/98	0.01 U
7/22/98	0.033
8/19/98	0.01 U
9/23/98	0.01 U
10/21/98	0.034
11/18/98	0.039
12/16/98	0.025
1/20/99	0.01 U
2/17/99	0.01 U
3/24/99	0.022
4/21/99	0.01 U
5/26/99	0.031
6/23/99	0.019
7/21/99	0.027
8/18/99	0.051
9/22/99	0.046
10/20/99	0.01 UJ
11/3/99	0.01 U
12/8/99	0.019
1/19/00	0.01 U
2/16/00	0.01 U
3/22/00	0.023
4/19/00	0.01 U
5/17/00	0.01 U
6/21/00	0.011
7/19/00	0.03
8/23/00	0.012
9/20/00	0.01 U
10/18/00	0.032
11/15/00	0.01 U
12/6/00	0.01 U
1/24/01	0.021
2/28/01	0.023
3/21/01	0.01 U
4/18/01	0.01 U
5/23/01	0.026
6/20/01	0.011
7/18/01	0.043
8/22/01	0.018

Lab Qualifiers:
J - The reported result is an estimate
U - The analyte was not detected at or above the reported result
U flagged data was accounted for as 0.5 times the undetected concentration.

Data Sources:
(1) 1990 Puyallup River TMDL Study (River Mile 8.3)
Data source is USGS unless otherwise indicated (River Mile 8.3)

Puyallup River
Upstream pH

Date	pH	Data Source
1/31/90	7.2	
2/28/90	7.3	
3/28/90	7.7	
4/25/90	7.1	
5/31/90	7.3	
6/27/90	7.3	
7/31/90	7.6	
8/29/90	7.5	
9/18/90	8.1	(1)
9/19/90	7.6	(1)
9/26/90	7.6	
10/2/90	7.7	(1)
10/3/90	7.6	(1)
10/31/90	7.7	
11/28/90	7.4	
12/19/90	7.6	
1/30/91	7.3	
2/27/91	7.3	
3/27/91	7	
4/24/91	7.4	
5/29/91	7.7	
6/26/91	7	
7/31/91	7.9	
8/28/91	7.4	
9/25/91	7.4	
10/30/91	7.2	
11/20/91	7.2	
12/18/91	7.4	
1/29/92	7.5	
2/26/92	7.3	
3/25/92	7	
4/29/92	7.6	
5/27/92	7.1	
6/24/92	7.5	
7/29/92	7.5	
8/26/92	7.4	
9/30/92	7.6	
10/27/92	7.5	
11/22/92	7.2	
12/21/92	7.6	
1/26/93	7.2	
2/23/93	7.3	
3/23/93	7.2	
4/27/93	7.5	
5/25/93	7.2	
6/29/93	7.5	
7/27/93	7.4	
9/28/93	7.2	

Date	pH
10/27/93	7.3
11/22/93	7.6
12/21/93	7.4
1/26/94	7.5
2/23/94	7.4
3/30/94	7.4
4/27/94	7.5
5/25/94	7.7
6/29/94	7.4
7/27/94	7.1
8/24/94	7.6
9/28/94	7.3
10/17/94	7.4
11/14/94	7.3
12/19/94	7.8
1/16/95	7.7
2/20/95	7.4
3/20/95	7.5
4/17/95	7
5/15/95	7.2
6/19/95	7.7
7/17/95	7.1
8/21/95	6.9
9/18/95	7.2
10/18/95	7.6
11/21/95	7.2
12/19/95	7.5
1/24/96	7.2
2/21/96	7.3
3/20/96	7.2
4/24/96	7.4
5/22/96	7.6
6/19/96	7.7
7/24/96	7.5
8/21/96	7.7
9/18/96	7.6
10/23/96	7.6
11/20/96	7.7
12/17/96	7.4
1/22/97	7.3
2/19/97	7.4
3/19/97	7.3
4/23/97	7.5
5/21/97	7.4
6/18/97	7.6
7/23/97	7.4
8/20/97	7.4

Date	pH
9/23/97	7.4
10/22/97	6.8
11/19/97	7
12/17/97	7.1
1/21/98	6.8
2/19/98	7.3
3/18/98	7.2
4/22/98	7.4
5/20/98	7.3
6/24/98	6.9
7/22/98	7.1
8/19/98	7.5
9/23/98	7.4
10/21/98	7.6
12/16/98	7.3
1/20/99	7.4
2/17/99	7.5
3/24/99	7.9
4/21/99	8.2
5/26/99	7.5
7/21/99	7.6
8/18/99	7.4
9/22/99	7.5
10/20/99	7.6
11/3/99	7.3
12/8/99	7.4
1/19/00	7.6
2/16/00	7.4
3/22/00	7.6
4/19/00	7.8
5/17/00	7.8
6/21/00	7.6
7/19/00	7.7
8/23/00	7.53
9/20/00	7.3
10/18/00	7.6
11/15/00	7.56
12/6/00	7.57
1/24/01	7.7
2/28/01	7.43
3/21/01	7.83
4/18/01	7.63
5/23/01	7.7
6/20/01	7.55
7/18/01	7.57
8/22/01	7.52
9/19/01	7.57

Data Sources:
(1) 1990 Puyallup River TMDL Study (River Mile 8.3)
Data source is USGS unless otherwise indicated (River Mile 8.3)

Puyallup River
Upstream Alkalinity (mg/L as $CaCO_3$)

Date	Alkalinity
9/18/90	27.8
10/2/90	24
10/3/90	26

Data Source:
(1) 1990 Puyallup River TMDL Study (River Mile 8.3)

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Puyallup River Upstream Metals Data

Source	Date	Mercury (ng/l)	
1	May-94	1	P
1	Jul-94	9	P
1	Sep-94	17	
1	Nov-94	2	P
1	Jan-95	1	U
1	Mar-95	1	P
1	Oct-95	2	
1	Dec-95	4	J
1	Feb-96	5	J
1	Apr-96	1	U
1	Jun-96	1	
1	Aug-96	3	
1	Oct-96	1	U
1	Dec-96	3	
1	Feb-97	3	
1	Apr-97	2	U
1	Jun-97	2	
1	Aug-97	3	
2	Feb-98	0.9	
2	Mar-98	2.5	
2	Apr-98	1.2	
2	May-98	2.1	
2	Jun-98	1.3	
2	Jul-98	2.8	
2	Aug-98	3.9	
2	Sep-98	3.9	
2	Oct-98	16.7	
2	Nov-98	0.7	
2	Dec-98	0.7	
2	Jan-99	2.4	
2	Feb-99	2.2	
2	Mar-99	1.9	
2	Apr-99	3	
2	May-99	1	
2	Jun-99	2.4	
2	Jul-99	2.4	
2	Aug-99	3.7	
2	Sep-99	66	
2	Oct-99	1.7	
2	Nov-99	6.6	
2	Dec-99	6.6	
2	Jan-00	6.6	
2	Feb-00	6.6	
2	Mar-00	6.5	

Date	Copper Dissolved (ug/L)	
May-94	0.446	P
Jul-94	0.531	
Sep-94	0.535	
Nov-94	0.865	
Jan-95	0.855	
Mar-95	1.55	
Oct-95	0.903	
Dec-95	0.708	
Feb-96	0.878	
Apr-96	1.37	
Jun-96	0.571	
Aug-96	0.49	
Oct-96	0.794	
Dec-96	0.77	
Feb-97	0.715	
Apr-97	0.781	
Jun-97	0.716	
Aug-97	0.514	

Date	Lead Dissoved (ug/L)	
May-94	0.02	U
Jul-94	0.02	U
Sep-94	0.02	U
Nov-94	0.208	
Jan-95	0.022	P
Mar-95	0.052	P
Oct-95	0.03	U
Dec-95	0.03	U
Feb-96	0.031	
Apr-96	0.042	
Jun-96	0.022	
Aug-96	0.02	U
Oct-96	0.031	
Dec-96	0.037	
Feb-97	0.03	U
Apr-97	0.15	
Jun-97	0.02	U
Aug-97	0.02	U

Date	Zinc Dissolved (ug/L)	
May-94	2.1	J
Jul-94	1	U
Sep-94	1	U
Nov-94	2.4	P
Jan-95	0.44	P
Mar-95	1.6	P
Oct-95	1.7	
Dec-95	5	U
Feb-96	1	U
Apr-96	0.56	
Jun-96	0.51	
Aug-96	0.87	
Oct-96	2.2	J
Dec-96	1.1	
Feb-97	0.86	
Apr-97	0.82	
Jun-97	0.21	
Aug-97	0.75	

Mercury Data Source:
1 USGS
2 Frontier Lab

All other metals data from USGS (River Mile 8.3)

The following statistical outliers were eliminated when calculating the background concentrations:
Mercury - 66 ng/L Sept. 1999; Copper - 1.55 ug/L March 1995, 1.37 ug/L April 1996; Lead - 0.208 ug/L Nov. 1994, 0.15 ug/L April 1

U flagged data was accounted for as 0.5 times the undetected concentration.
For Zinc, the undetected concentration of 5 ug/L (Dec. 1995) was eliminated since it is the highest value in the data set.

Lab Qualifiers:
J - The reported result is an estimate
P - Result is between the detection limit and the minimum quantitation limit
U - The analyte was not detected at or above the reported result

Puyallup WWTP - Monitoring Data

	Temperature
Chronic Criterion, deg. C	18
Standard Deviation	3.18
CV	0.19
C_e, deg. C	26.24
C_u, deg. C	15.3
Chronic C_d, deg. C	16

Effluent Data:

Date	deg. C	Date	deg. C
01/31/96	12.56	01/31/99	12.1
02/29/96	11.4	02/28/99	11.9
03/31/96	13	03/31/99	12.9
04/30/96	14.4	04/30/99	14.25
05/31/96	15.4	05/31/99	18.5
06/30/96	18	06/30/99	19.6
07/31/96	20	07/31/99	20.3
08/31/96	21	08/31/99	20.8
09/30/96	20	09/30/99	20.7
10/31/96	18	10/31/99	18.0
11/30/96	15.3	11/30/99	16.7
12/31/96	12.2	12/31/99	16.1
01/31/97	11.0	01/31/00	15.5
02/28/97	11.7	02/29/00	15.3
03/31/97	12	03/31/00	16.6
04/30/97	14.2	04/30/00	18.7
05/31/97	16.6	05/31/00	18.8
06/30/97	18.0	06/30/00	19.9
07/31/97	19.4	07/31/00	22.0
08/31/97	21.2	08/31/00	22.7
09/30/97	20.4	09/30/00	22.6
10/31/97	18.1	10/31/00	20.2
11/30/97	16.1	11/30/00	17.4
12/31/97	14.2	12/31/00	16.1
01/31/98	12.4	01/31/01	14.6
02/28/98	13.4	02/28/01	13.7
03/31/98	13.8	03/31/01	15.7
04/30/98	15.2	04/30/01	16.7
05/31/98	17.1	05/31/01	18.2
06/30/98	18.5	06/30/01	19.3
07/31/98	20.5	07/31/01	20.7
08/31/98	21.5	08/31/01	21.3
09/30/98	20.8	09/30/01	20.5
10/31/98	18.9	10/31/01	18.7
11/30/98	16.1	11/30/01	16.3
12/31/98	13.4	12/31/01	14.1

C_u = Upstream Concentration
CV = Coefficient of Variation
C_e = Maximum Projected Effluent Concentration
C_d = Maximum Projected Downstream Concentration at Edge of Mixing Zone

Puyallup WWTP - Monitoring Data and Effluent Limits

	Copper	Lead
Acute Criterion (dissolved), ug/L	3.0	6.3
Chronic Criterion (dissolved), ug/L	2.4	0.25
Acute Criterion (total), ug/L	na	na
Chronic Criterion (total), ug/L	na	na
C_u (Total), ug/L	1.03	0.06
Maximum Effluent Concentration	54	4
CV	0.773	0.882
C_e (total), ug/L	158.59	13.19
Acute C_d (total)	88.56	7.36
Chronic C_d (total)	14.73	1.20
Acute C_d (dissolved), ug/L	76.34	5.05
Chronic C_d (dissolved), ug/L	12.70	0.83
WLA_acute, ug/L	5.52	16.52
WLA_chronic, ug/L	20.60	3.49
LTA_acute, ug/L	1.42	3.77
LTA_chronic, ug/L	9.27	1.43
MDL, ug/L	5.5	6.3
AML, ug/L	3.5	3.7
Mass Loading MDL, lbs/day	0.64	0.73
Mass Loading AML, lbs/day	0.41	0.43

Effluent Data:	Copper Date	Copper ug/L	Lead Date	Lead ug/L
	11/27/96	15	05/08/01	0.5
	02/25/97	10	11/12/00	0.5
	05/15/97	24	08/15/00	0.5
	08/06/97	24	05/22/00	1
	11/13/97	1 U	03/07/00	0.5
	02/25/98	1 U	12/13/99	0.5
	05/13/98	14	09/21/99	0.5
	08/13/98	1 U	06/29/99	4
	10/21/98	23	04/13/99	2
	04/13/99	46	10/21/98	0.5
	06/29/99	32	08/13/98	2
	09/21/99	4	05/13/98	1
	12/13/99	20	02/25/98	2
	03/07/00	28	11/13/97	0.5
	05/22/00	15	08/06/97	1
	08/15/00	8	05/15/97	3
	11/12/00	31	02/25/97	0.5
	05/08/01	54	01/01/96	0.5

C_u = Upstream Concentration
CV = Coefficient of Variation
C_e = Maximum Projected Effluent Concentration
C_d = Maximum Projected Downstream Concentration at Edge of Mixing Zone
WLA = Wasteload allocation
LTA = Long term average
MDL = Maximum Daily Limit
AML = Average Monthly Limit

U = Parameter was not detected at 2 times the indicated concentration.
(1) Statistical outliers were eliminated. These include: Lead - 16 ug/L on 11/27/96.

Puyallup WWTP - Monitoring Data and Effluent Limits

	Zinc		Mercury	
Acute Criterion (dissolved), ug/L		24.4		na
Chronic Criterion (dissolved), ug/L		22.1		na
Acute Criterion (total), ug/L		na		2.4
Chronic Criterion (total), ug/L		na		0.012
C_u (Total), ug/L		2.5		0.0088
Maximum Effluent Concentration		79		0.06
CV		0.655		0.447
C_e (total), ug/L		202.34		0.100
Acute C_d (total)		113.52		0.060
Chronic C_d (total)		19.88		0.017
Acute C_d (dissolved), ug/L		101.15		NA
Chronic C_d (dissolved), ug/L		17.71		NA
WLA_acute, ug/L		47.26		4.31
WLA_chronic, ug/L		258.83		0.05
LTA_acute, ug/L		14.07		1.75
LTA_chronic, ug/L		129.57		0.03
MDL, ug/L		47		0.069
AML, ug/L		31		0.052
Mass Loading MDL, lbs/day		5.5		0.008
Mass Loading AML, lbs/day		3.6		0.006
Effluent Data:	Date	ug/L	Date	ug/L
	05/08/01	26	01/09/95	0.03
	11/12/00	38	01/09/95	0.02445
	08/15/00	60	01/09/95	0.0237
	05/22/00	32	01/09/95	0.03
	03/07/00	25	01/16/95	0.05
	12/13/99	10	01/16/95	0.03
	09/21/99	35	01/16/95	0.02668
	06/29/99	61	01/16/95	0.02245
	04/13/99	7	01/23/95	0.02
	10/21/98	13	01/23/95	0.01933
	08/13/98	13	01/23/95	0.02
	05/13/98	38	01/23/95	0.01914
	02/25/98	49	01/30/95	0.01735
	11/13/97	1 U	01/30/95	0.05
	08/06/97	79	02/06/95	0.02
	05/15/97	52	02/06/95	0.01833
	11/27/96	54	02/13/95	0.01
	01/01/96	13	02/13/95	0.01835
			02/21/95	0.03
			02/21/95	0.0356
			02/27/95	0.06
			02/27/95	0.01926
			03/06/95	0.02625
			03/13/95	0.027945
			03/13/95	0.03
			03/20/95	0.01
			03/20/95	0.02102
			03/27/95	0.03
			04/03/95	0.03
			03/31/96	0.03
			04/30/96	0.03
			07/31/96	0.02
			08/31/96	0.0002

C_u = Upstream Concentration
CV = Coefficient of Variation
C_e = Maximum Projected Effluent Concentration
C_d = Maximum Projected Downstream Concentration at Edge of Mixing Zone
WLA = Wasteload allocation
LTA = Long term average
MDL = Maximum Daily Limit
AML = Average Monthly Limit

U = Parameter was not detected at 2 times the indicated concentration.
(1) Statistical outliers were eliminated. These included: Zinc - 120 ug/L on 2/25/97.
(2) A mercury value of 0.08 ug/L on 3/6/95 was eliminated due to laboratory QC results.
(3) No non-detect data were included in mercury calculation, due to high detection limit.

Puyallup WWTP - Monitoring Data and Effluent Limits

	NH3 Total (as N) Nov. - April		NH3 Total (as N) May - Oct.	
Acute Criterion, mg/L		8.3		6.7
Chronic Criterion, mg/L		1.6		1.3
Standard Deviation		3.49		2.99
CV		0.77		0.92
C_e, mg/L		38.53		35.06
C_u, mg/L		0.05		0.04
Acute C_d, mg/L		21.4		19.50
Chronic C_d, mg/L		3.40		3.09
WLA_acute, mg/L		14.90		12.028
WLA_chronic, mg/L		17.88		14.53
LTA_acute, mg/L		3.84		2.64
LTA_chronic, mg/L		8.06		5.76
MDL, mg/L		14.9		12.0
AML, mg/L		5.8		4.2
Mass Loading MDL, lbs/day		1,737		1,399
Mass Loading AML, lbs/day		676		490
Effluent Data:	Date	NH3 (mg/L)	Date	NH3 (mg/L)
	11/30/99	2.1	06/30/99	6.0
	12/31/99	5.6	07/31/99	2.8
	01/31/00	8.4	08/31/99	1.4
	02/29/00	4.1	09/30/99	9.3
	03/31/00	11.1	10/31/99	1.7
	04/30/00	1.6	05/31/00	1.1
	11/30/00	3.7	06/30/00	2.7
	12/31/00	2.2	07/31/00	5.2
	01/31/01	3.9	08/31/00	3.1
	02/28/01	11.7	09/30/00	1.5
	03/31/01	3.2	10/31/00	2.5
	04/30/01	0.5	05/31/01	0.3
	11/30/01	3.2	06/30/01	0.5
	12/31/01	2.0	07/31/01	0.5
			08/31/01	5.8
			09/30/01	9.9
			10/31/01	0.8

C_u = Upstream Concentration
CV = Coefficient of Variation
C_e = Maximum Projected Effluent Concentration
C_d = Maximum Projected Downstream Concentration at Edge of Mixing Zone
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APPENDIX G - PRE-CERTIFICATION OF DRAFT PERMIT

DRAFT CERTIFICATION UNDER 401 OF THE CLEAN WATER ACT FOR PUYALLUP WASTEWATER TREATMENT PLANT (PUYALLUP, WASHINGTON)

As required under section 401 of the Clean Water Act, the Puyallup Tribe of Indians has been requested by EPA to certify that the wastewater discharged from the City of Puyallup Wastewater Treatment Plant will comply with the Water Quality Standards for Surface Waters of the Puyallup Tribe. Region X EPA is proposing to issue a National Pollutant Discharge Elimination System (NPDES) permit (WA-003716-8) to the City of Puyallup Wastewater Treatment Plant, authorizing the discharge of wastewater from the wastewater treatment facility located in the City of Puyallup to the Puyallup River at latitude 47º12'26"N, longitude 122º 19' 11" W.

Upon review of draft NPDES permit (WA-003716-8), the Puyallup Tribe of Indians is granting pre-certification under section 401 of the Clean Water Act that there is reasonable assurance that the proposed activity and resulting discharge is in compliance with requirements of the Clean Water Act and Water Quality Standards for Surface Waters of the Puyallup Tribe provided that the following conditions are satisfied:

1. A mixing zone pursuant to section 9 of the Tribe's Water Quality Standards is authorized for metals (copper, lead, mercury, and zinc), pH, and ammonia provided that the City of Puyallup monitor annually during critical conditions at the edge of the mixing zone to demonstrate attainment of water quality criteria for these parameters. A Quality Assurance Project Plan shall be submitted to the Tribe's Environmental Protection Department for review and approval prior to sampling.

2. Fluoride study – Prior to fluoridation of the city's water supply, a fluoride toxicity study shall be conducted to ensure compliance with Section 5(1) of the Water Quality Standards for Surface Waters of the Puyallup Tribe. Section 5(1) of the Tribe's Water Quality Standards state "Toxic substances shall not be introduced above natural background levels in surface waters of the Puyallup tribe which have the potential either singularly or cumulatively to adversely affect characteristic uses, cause acute or chronic conditions to the most sensitive biota dependent on those waters, or adversely affect public health, as determined by the Department." Influent and effluent concentrations, treatment plant removal effectiveness, background concentrations in the Puyallup River, and effects to salmonids and the "most sensitive biota" in the lower Puyallup River, at a minimum, shall be addressed. The study's scope and methods shall be approved by the Department prior to commencing the study.

3. The Tribe grants the City of Puyallup a compliance schedule of three years from the effective date of the permit to meet the draft copper and zinc limits of Part 1.A (Table 1).

Until compliance with the effluent limits is achieved, at a minimum, the City of Puyallup must complete the following tasks:

a. By the 12th month from the effective date of the permit, complete a study to determine the source(s) of copper and zinc in the wastewater treatment plant effluent and identify opportunities for reduction of copper and zinc levels at the source.

b. By the 18th month from the effective date of the permit, submit a plan to the Tribe, EPA, and Ecology that investigates the measures to ensure compliance with the copper and zinc limits.

c. By the 24th month from the effective date of the permit, select the measures to enable compliance with the draft permit copper and zinc limits. Notify the Tribe, EPA, and Ecology in writing of the selected measures. Readily implementable measures must be implemented as soon as feasible.

d. By the 36th month from the effective date of the permit, the City of Puyallup must have implemented selected improvements to enable the treatment plant to meet draft permit copper and zinc limits. Within 14 days of making the improvements to the plant, notify the Tribe, EPA, and Ecology that improvements have been completed.

e. The City of Puyallup must submit an annual report of progress that outlines the progress made toward reaching the compliance date for the copper and zinc effluent limits. The annual report must be submitted to the Tribe, EPA and Ecology by January 1 of each year. At a minimum, the annual report should include: an assessment of the first year of monitoring data and comparison to the effluent limits; a report on progress made toward meeting effluent limits, including the applicable deliverables as required above; and further actions and milestones targeted for the upcoming year.

4. Per Sections 2 and 5 of Water Quality Standards for Surface Waters of the Puyallup Tribe, effluent limits for hardness-dependent metals (copper, lead, and zinc) shall be based on hardness of the receiving water alone.